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Training Analyses Supporting the Land Warrior and Ground Soldier Systems

Jean L. Dyer and Jennifer S. Tucker
U.S. Army Research Institute

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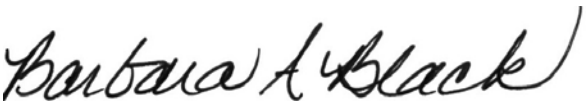

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This report documents two training analyses conducted in 2005 through 2007 on the Land Warrior (LW) and Ground Soldier System (GSS), respectively, as part of Analysis of Alternatives efforts on these systems, which supported milestone decisions for each system. One analysis assessed the sufficiency of the LW New Equipment Training conducted for a Stryker Battalion. The other examined the institutional impact of equipping seven Stryker Brigade Combat Teams with the GSS. The assessment and research techniques used in the training analyses have general applicability to estimation of training requirements and resources for other developing systems. The report also provides an audit-trail of individual tasks associated with dismounted ground Soldier systems.

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TRAINING ANALYSES SUPPORTING THE LAND WARRIOR AND GROUND SOLDIER SYSTEMS

EXECUTIVE SUMMARY

Research Requirement:

From 1998 to 2009, the Army Research Institute (ARI) at Ft. Benning, GA conducted training analyses and assessments that provided input to Army decisions regarding equipping and fielding the Land Warrior (LW) system and the Ground Soldier System (GSS). Historically, many ARI analyses provided direct support to the Infantry School as proponent for the LW system, to the Training and Doctrine Command (TRADOC) Capabilities Manager-Soldier (TCM-Soldier), and to the Project Manager-Land Warrior (PM-LW). Some training analyses have been part of larger analytic studies led by the TRADOC Analysis Command at White Sands Missile Range (TRAC-WSMR). These analyses focused on the impact that fielding of the LW system and/or GSS would have on institutional courses and/or how to best conduct New Equipment Training (NET) for these systems.

The current report documents two training analyses conducted from 2005 through 2007 respectively as part of Analysis of Alternatives (AOA) efforts led by TRAC-WSMR. One assessed the sufficiency of the LW NET conducted for a Stryker Battalion. The other analysis examined the institutional impact of equipping seven Stryker Brigade Combat Teams with the GSS. The LW analysis was based on Soldiers using LW systems, whereas the GSS analysis was based on a system concept as reflected in an Army requirement document for the system; there was no GSS hardware.

Procedure:

The LW NET assessment included formal, on-site observations of the LW training given to a Stryker Battalion which was scheduled for deployment to Iraq. This unit was the Army's first unit equipped with this system. The other primary data sources were Soldier and leader surveys plus focus group sessions with the three Stryker companies equipped with the LW system. In addition to assessing NET, the analysis was to recommend what should be included in future NET and to estimate the associated training resources for future NET programs. These analyses were conducted for two basis of issue alternatives: one where team leaders and above had the LW system and one where all Soldiers had the system. The NET observations plus historical training projections for the LW system served as the primary bases for the recommended NET and estimated training resources.

The GSS analysis focused primarily on the impact on institutional training with the fielding of this system, and secondarily on NET for the GSS. Two alternatives were examined: one where team leaders and above had the GSS and one where squad leaders and above had the GSS. A front-end analysis identified the tasks required by the GSS, as indicated by the requirements document, and any differences between the LW system and GSS. The

recommended training programs of instruction leveraged the findings from the Stryker NET assessment and applied analytic procedures developed in a 2005 analysis conducted by ARI, on the impact of the LW Block II system on institutional training.

Findings:

The LW NET conducted for the Stryker battalion was assessed to be inadequate. In general, as executed the NET was not sufficient in terms of time, tasks addressed, and training strategy and methods. Consequently, individuals were not fully trained to operate, maintain, and employ the system; units had limited collective training on system employment techniques; unit leaders were not fully enabled to conduct sustainment training. Suggestions were made on how to improve the training of Soldiers, leaders and units, and on how training on future ground Soldier systems could be enhanced. The recommended NET specified leader and non-leader tracks in order to tailor the training. The recommended training time for a company doubled, from 9 to 18 days. In addition, the collective training phase of NET was designed to leverage the capabilities of the system, to progress systematically from squad to platoon to company to gain the necessary employment skills at different echelons, to instill confidence in all individuals with the system, and to provide the conditions whereby Soldiers and leaders could recognize and experience the value of the system. A layout of the resources, including time, to conduct a Battalion-size NET was provided, with the estimated training resources greater for the All Soldier alternative than the Team Leader and above alternative.

The GSS analysis found few differences in the individual tasks associated with the LW system and GSS. Leader (platoon level and above) and non-leader tracks were identified, with the non-leader tracks emphasizing weapon-system skills, day and night navigation and day and night situational awareness, with particular emphasis on system employment in field exercises. Leaders were to receive more training on planning, orders and communication processes. Regardless of alternative, time requirements were the same: recommended institutional training time was 14 days. A layout of the resources, including time to conduct a Brigade NET was provided. The time requirement for each alternative was the same (4 weeks), but other training resources, such as number of instructors, were less for the squad leader alternative than the team leader alternative.

Utilization and Dissemination of Findings:

Both assessments were disseminated to TCM-Soldier, PM –LW, the US Army Infantry School, and TRAC-WSMR. The results were incorporated in TRAC-WSMR's AOA briefings to TRADOC. In addition, the TCM-Soldier used the LW NET Assessment as part of its In-Country Assessment Report to TRADOC on the Stryker Battalion's employment of the LW system in Iraq.

TRAINING ANALYSES SUPPORTING THE LAND WARRIOR AND GROUND SOLDIER SYSTEMS

CONTENTS

Training Analyses Supporting the Land Warrior and Ground Soldier Systems

Background

Since 1998 the Army Research Institute (ARI) Research Unit at Ft. Benning, GA has conducted a series of training analyses and training assessments that provided input to Army decisions regarding equipping and fielding Soldiers and leaders with systems that incorporate wearable computers. These systems are important combat multipliers, as they enable ground Soldiers and leaders to interface with the other digitally–enabled Army systems; in other words, the systems connect the ground force to the digital battlefield. The systems enhance the communication capabilities, command and control, and situational awareness and understanding of the ground force. The two systems examined in these ARI training analyses were the Land Warrior (LW) system and the Ground Soldier System (GSS). The GSS will be the fielded Army system (the objective system), although selected Army units have been equipped with LW systems.

The training analyses of these systems contributed to the knowledge and understanding of what constitutes effective training on these ground Soldier systems. In addition, the assessment and analytic techniques have general applicability to program evaluations of new systems and to techniques for estimating training resource requirements.

LW History

The LW program preceded the GSS program with a Mission Need Statement for the LW approved in 1993, followed by a system requirement document in 1994. Since 1994, the LW requirement documents were updated, and different versions of the LW system were built as technology and user requirements evolved. LW systems have been examined in Army experiments, and some Stryker units have been equipped with the system. From a historical perspective, the different LW systems have served as prototypes for the objective GSS, and as a lessons-learned test bed for the GSS. Currently, there is a requirement document for the GSS, but there is no actual system as the GSS is in its initial research and development phase. The initial requirement document was written in 2006 (US Army Training and Doctrine Command [TRADOC], 2006). The GSS requirements are similar to those for the LW system.

As indicated, the LW system has evolved with time. Common to all LW versions has been a wearable computer, with special software, linked to a network, a global positioning system which tracks the location of every individual with a system, a helmet-mounted display, and a radio which is also linked to the network. The helmet-mounted display enables the Soldier/leader to see maps, graphic control symbols, messages, their own position and the position of others, and mission orders. Soldiers and leaders with a system can create, send, and receive messages, orders, and graphics. Earlier versions of the system also had an integrated weapon subsystem which allowed Soldiers to fire their weapon via a projected image of a target transmitted from either a daylight or thermal weapon sight to their helmet-mounted display. The exact LW system configuration, weight, and location and size of major components have

changed with system evolution. [See Copeland (2007) for a description of one version of the LW system.]

Prior Training Analyses

During the research and development phase of a system, many analyses are required to support milestone decisions about the system and whether it will progress to the next phase of development. For example, analyses examine the system's potential warfighting impact and resource requirements. Simulations are conducted to gain insights into what will happen on the battlefield with a force that has the system and with a force that does not have the system. Logistical impacts and personnel requirements (operator and maintainer) are examined. There are analyses of the training impacts as well. Historically, ARI has conducted training analyses of the LW system in support of the system development process. The scope of ARI's initial training analyses is summarized in this section.

Many of the training analyses conducted by ARI directly supported the Infantry School as proponent for the LW system, the TRADOC Capabilities Manager-Soldier (TCM-Soldier), formerly named TRADOC Systems Manager-Soldier (TSM-Soldier), and the Project Manager-Land Warrior (PM-LW). Some training analyses were part of larger analytic Army studies led by the Training and Doctrine Command (TRADOC) Analysis Command at White Sands Missile Range (TRAC-WSMR). The training analyses focused on the impact that fielding of the LW system would have on institutional training.

The first major training analysis of the potential impact of the LW system on institutional training was conducted in 2000 (Centric, Wampler, & Dyer, 2000). That analysis examined several options for integrating LW training in the United States Army Infantry School (USAIS) courses, specifically the Infantry Officer Basic Course (IOBC), the Basic Noncommissioned Officer Course (BNCOC), and Infantry One Station Unit Training (OSUT). These three courses were examined since it was assumed LW users would come from the personnel attending these courses. It was also assumed that no functional courses would be developed specifically for LW training. Following 2000, there were major changes in the LW system design, and courses at the Infantry School were modified substantially. These changes made the initial training analysis less relevant to follow-on analytic efforts.

The second training analysis was conducted in 2004 (Dyer, Centric, & Dlubac, 2006). This training analysis was part of a larger analysis of alternatives (AOA) effort by TRAC-WSMR (Habic, Johnson, & Nantze, 2005), which provided analysis support to the LW Block II Operational Requirements Document (ORD) in preparation for a Joint Requirements Oversight Council (JROC) review. A decision made during the conduct of the analysis was to equip a Stryker Brigade Combat Team (SBCT) battalion with LW Block II and to advance the program to Block III, or the Ground Soldier component of the Soldier-as-a-System (SaaS) program.

The training analysis addressed the institutional training implications of four alternative basis of issue plans (BOIPs) for the LW system. The four alternative BOIPs were: current equipment plus every Soldier in the rifle platoon with a radio, current equipment with LW system down to the rank of squad leader, current equipment with LW system down to the rank of

team leader, and current equipment with every Soldier in the platoon with a LW system. The training analysis addressed in detail the required tasks, critical tasks, prerequisite skills, and training resources required to support institutional training for each BOIP. The courses addressed were IOBC, BNCOC, OSUT and the Advanced Noncommissioned Officer Course (ANCOC). This analysis relied heavily on information gained by ARI researchers who observed and assessed additional LW training and testing events conducted between 2000 and 2004. These observations provided objective data about task difficulty, effectiveness of training techniques, and required training time. They were essential building blocks in delineating the tasks to be trained and required resources.

Current Training Analyses

The current report contains two later training analyses, and are presented at Appendixes A and B. Both were part of larger AOA efforts led by TRAC-WSMR. These training analyses focused on the impact that fielding of the LW system and/or GSS would have on institutional training as well as how to best conduct New Equipment Training (NET) for these systems and the resources required for NET. TRAC-WSMR then integrated the NET resources into the final cost estimates for the system.

Independent assessments of NET are done infrequently. However, an examination of NET is important, as the program of instruction during NET is often the model for what is done in institutional training. In addition, NET has long-term consequences in terms of Soldier, leader, and unit preparedness with a system. The NET assessments and training resource estimations were critical input to the US Army Infantry School's System Training Plan (STRAP) for the LW system. The STRAP is a required document that specifies the system proponent's master training plan and necessary resources to support training once a system is fielded.

The first analysis, *Land Warrior New Equipment Training Assessmen*t, was conducted in 2005-2006. It supported a Land Warrior (LW)/Mounted Warrior (MW) Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities (DOTMLPF) Assessment to inform a March 2007 LW Milestone C decision (Wainer, et al., 2007, 2008). This assessment determined the impacts of equipping a Stryker unit with LW and MW expressed in terms of unit force effectiveness, impacts to the DOTMLPF domains, life cycle cost, and ability to mitigate Joint Capabilities Integration and Development System (JCIDS) small unit capability gaps. These gaps had been identified in the prior LW Block II AOA effort cited previously (Habic et al., 2005). The training analysis, included in its entirety at Appendix A, focused on data obtained during the NET provided to a Stryker battalion equipped with the LW system prior to its deployment to Iraq in Operation Iraqi Freedom.

The second training analysis, *Ground Soldier System Training Impact Analysis: Institutional Training and New Equipment Training* was conducted in 2007. It was a follow-on to the LW NET assessment and focused on institutional training requirements. This report is included in its entirety at Appendix B. The GSS Training Impact Analysis was one component of the GSS DOTMLPF assessment, which in turn was part of the larger GSS AOA, led by TRAC-WSMR, which informed a GSS Milestone B decision.

Both training reports were provided to the TRADOC sponsor, the Infantry School, to the TCM-Soldier, to PM-LW, and to the lead analytic agency, TRAC-WSMR. A summary of each analysis is provided below.

Summary: Land Warrior New Equipment Training (NET) Assessment

The NET assessment addressed two training issues. The first was to determine the sufficiency of NET where the LW system was given to all Soldiers within a Stryker rifle platoon in addition to selected individuals at company and battalion. The second issue was to recommend a NET program of instruction (POI) for two LW BOIP alternatives. One alternative specified equipping all Soldiers with LW as was done in the actual NET. The other alternative specified equipping Soldiers only down to the team leader level and its equivalent throughout the company and battalion.

Sufficiency of the LW NET

The LW NET received by the Stryker Battalion in 2006 was assessed to determine if it was adequate and could serve as the basis for future LW NET. The assessment examined the NET resources, the skills and tasks trained, and the effectiveness of the training. All Soldiers and leaders within each of three companies received the LW system as well as selected duty positions at battalion level. The data sources used in the assessment were: NET lesson plans, training support materials, interviews with the NET trainers, reports on prior experiments with LW prototypes, the preliminary Army Test and Evaluation Command (ATEC) LW System Evaluation Report (SER), and results from formal on-site observations of NET for two companies, the NET performance test, an end-of-course NET survey, a consolidated survey given to all companies four months after NET, focus group sessions, and a lethality experiment.

In addition, guidance from the USAIS and Army regulations regarding NET served as the framework for determining if the intent of NET was achieved. Specifically, NET should train Soldiers so that they can operate and maintain the system, and the unit can conduct sustainment training following NET. In recommending a NET POI, the focus was on requirements to conduct the necessary training and was not constrained to a pre-specified period of time. In addition, the NET assessment was to address doctrine and tactics training (DTT).

The NET for each of the three companies was nine days. The first week of training was conducted in a large 100-man classroom, with battalion personnel distributed throughout the three company NET sessions. Skill level 1 system assembly and operation tasks were trained. The second week of training was conducted on ranges and in training areas. The individual skills of marksmanship and land navigation were addressed. Collective training was conducted by unit personnel, not the NET cadre.

The overall assessment was that the NET, as executed, was not sufficient in terms of time, tasks addressed, and training strategy and methods. Consequently, individuals were not fully trained to operate, maintain, and employ the LW system; units had limited collective training on system employment techniques; unit leaders were not fully enabled to conduct

sustainment training. The primary reasons for concluding that the NET POI was not sufficient, as executed, are given below.

Only a subset of the required individual skills and collective tasks was trained. For example, marksmanship training included familiarization only and there was no night training. Soldier (leader and nonleader) reactions reflected these weaknesses in that Soldier usage and proficiency ratings of many LW tasks and skills were low. Training on LW system troubleshooting was limited, resulting in a dependency on contractor logistics support. Although small-group hands-on practical exercises (PEs) were conducted on core tasks, the dedicated time each individual spent practicing these tasks was limited during these PEs. The exercises did not focus on system employment, only system operation.

The training was not tailored. Given the structure of NET (e.g., training given to an entire company in a single classroom), the trainers were unable to adapt to the diversity in learning rates and military experience in the target population. Leader skills, particularly leader planning and duty-specific skills, were not covered and/or stressed. Leaders in the focus groups identified a need for leader planning training. Leaders were not given technical information on the system and the network, information essential to operations and sustainment training. In addition, there was no time to address weaknesses in prerequisite skills.

The DTT was also judged as inadequate. As executed, the DTT deviated from the plan, in that the unit (not the NET cadre) conducted the collective training. It was short, the equivalent of one day. Collective training did not progress systematically from squad to platoon to company. The NET cadre did not have the opportunity to prepare unit leaders for planning and conducting collective training exercises that would leverage the capabilities of the LW system.

NET did not provide the foundation for nonleaders to increase their expertise after NET. Immediately after NET, at least 60% of the leaders felt they were proficient on 6 of 17 common LW tasks; while similar percentages of nonleaders indicated proficiency on 9 of these tasks. Yet at the end of unit training, a sizeable percentage of nonleaders (20% to 45%) indicated they were never proficient on 14 of these 17 tasks. For leaders, this was the case for only 4 of the 17 tasks. An improved NET should increase the initial level of expertise for all individuals, not just leaders, and minimize differential impacts within the target population.

Training in NET was not sufficient to instill confidence in leaders. Leaders' ratings of their confidence in the proficiency of the individual skills of Soldiers in their unit and of their unit's collective skills were not high immediately after NET (15% to 30% of leaders were confident). Leader confidence in these skills increased in the company that participated in the Limited User Test (LUT). The LUT required additional specific preparation and the unit had to systematically employ the LW system during the LUT. As a result of the LUT, the percentage of leaders in this company who were confident rose by 33%, as compared to a 4% increase by leaders in the other companies that did not participate in the LUT. At the end of unit training, 90% of the leaders from the company in the LUT were confident regarding individual and unit proficiency, while only 60% to 75% of leaders from the other two companies were confident.

At the end of NET, proficiency was tested on only skill level 1 system assembly and operation tasks. Other critical tasks, both individual and collective, were not assessed.

Emerging results from the ATEC SER provided independent confirmation of some of the performance weaknesses identified in the NET assessment. Specifically, these areas were: duty specific skills related to a multi-functional laser system, marksmanship skills, and maintaining and troubleshooting the system. In addition, the SER indicated that as the company leaders became more proficient during the LUT, they saw more utility to the LW system. This finding supported the assessment that the NET was too short and that collective exercises which leveraged LW functions were needed.

Recommended NET Programs of Instruction for Each LW Alternative

Regardless of LW BOIP alternative, the recommendations for NET POI content, the length of the POI, the training strategy, methods of training, and exit criteria were the same. The recommended NET POI addressed the weaknesses identified with the Stryker Battalion NET. The recommended NET POI, executed at company level, enabled tailored training by establishing two tracks for individual training: a leader-digital planner track for leaders at the platoon level and above, and a squad/section track that incorporated squad training. NET was lengthened from 9 days to a total of 19 days for the alternative where all Soldiers were to be trained, and to 18 days for the alternative where Soldiers down to only the team leader level were trained. The expanded NET included 14/15 days of individual training and individual testing in each track followed by 4 days of integrated collective, employment training starting at the platoon level.

The recommended POI also specified that individuals must pass multiple exit criteria in the individual training phase. The NET cadre would conduct the initial collective training, followed by unit-led training, rather than the unit conducting this entire phase of the training. The proponent for the LW system would assess collective proficiency at the squad, platoon, and company echelons. The recommended increase in the length of the NET POI allowed time to train all required individual and collective tasks, to integrate LW skills into the unit's repertoire of individual and collective skills, to assess individual and collective performance, and to prepare leaders to conduct sustainment training.

Training Resources

The recommended POI addressed methods of training and training resources to enhance individual and unit expertise. As a unit's capability to conduct sustainment training is critical, the training recommendation was that the training materials the NET team leaves with the unit should be augmented and enhanced in order to minimize the training burden for unit leaders.

Because twice as many Soldiers were equipped with the LW system in the All Soldier alternative than in the Team Leader alternative (1,576 versus 731 individuals), the NET training resources for a Stryker Brigade for the All Soldier alternative were greater than those for Team Leader alternative. For the All Soldier alternative, the estimated time to conduct NET for a Stryker Brigade was five months; the maximum number of instructors required during any NET

cycle was 60. For the Team Leader alternative, the estimated time to conduct NET for a Stryker Brigade was three months; the maximum number of instructors required during any NET cycle was 53.

Summary: Ground Soldier System Training Impact Analysis: Institutional Training and New Equipment Training (NET)

The GSS AoA, conducted in 2007, compared two BOIP alternatives to the base case of current equipment. One alternative was the GSS issued down to the squad leader level, and the second was the GSS issued down to the fire team leader level. The study directive for the AOA specified that the analysis be restricted to seven (7) Stryker Brigade Combat Teams (SBCTs). The training analysis addressed three issues for each alternative. The first was to determine changes within institutional training. The second addressed changes in unit training, both individual and collective tasks. The third addressed the recommended POI for each alternative including associated resources and the skills and tasks to train.

Functional courses were examined instead of existing institutional courses. This was based on a decision made in 2002 by the Commanding General, USAIS that only after half the force had been fielded with the LW system (nee GSS) would LW (GSS) training be formally incorporated in existing institutional courses. Prior to that time, functional courses would be used for training replacement Soldiers/leaders on the system.

The GSS analysis built on prior analyses, specifically the 2006 LW Block II Training Impact Analysis (Dyer, et al., 2006), and the NET assessment in Appendix A of this report. In addition, some limited information on task difficulty and frequency of use was obtained from a small sample of leaders in the Stryker Battalion who were deployed to Iraq with the LW system. This information was obtained during the initial phase of their deployment.

Program of Instruction Analysis

A front-end analysis identified the GSS tasks for the functional courses. These tasks reflected current LW tasks and additional tasks specified in the GSS Capability Development Document (TRADOC, 2006).

As with the LW NET assessment, the recommendation was to establish two tracks for training. One track, called the Leader-Digital Planner track, included leaders responsible for mission planning at the platoon level and above. This track also included personnel who support these leaders in mission planning. The other track was for individuals at the squad and equivalent echelons, called the Squad track. The core POI was the same for both GSS BOIP alternatives. For both tracks, the core POI with a performance test was 14 days, and totaled 16 days with administrative in- and out-processing time. The primary differences between the two tracks were that only the Leader-Digital Planner track had training on mission planning and individuals in this track focused on night, not day, land navigation. Those in the Squad track were to receive more training on reduced exposure observation, scanning, and target engagement techniques; both day and night land navigation; and more day and night situational exercises.

Individual training also specified a high degree of field exercise time to enable Soldier and leaders to hone their individual skills.

Survey responses from the limited number of leaders (n = 14) from the Stryker battalion deployed to Iraq with the LW system indicated that the tasks and functions included in the core POI were relevant and appropriate. In particular, these leaders stressed the importance of voice communications, maintaining situational awareness, use of the global positioning system, sending text messages, and using pre-loaded digital images. A major trend in these surveys was that a new system feature, one not incorporated in the LW system during NET, was proving to be very valuable. This software feature, called "tactical chem lights," allowed individuals to use small colored ovals to mark important terrain features/mission actions on their map displays. Typical features marked were the location of an enemy position, where to enter a building, and which buildings were cleared. Orders and overlays were used primarily by higher-level leaders. The weapon subsystem components and some message formats were not used frequently. Responses also indicated that system use and criticality could be mission dependent; features important in one mission were not necessarily important in another context. In addition, the results suggested that certain functions may be more closely linked to some duty positions than others.

These leaders indicated that situation awareness and understanding were enhanced substantially by the LW system but there were no changes to existing tactics, techniques, and procedures. The system allowed Soldiers to execute missions faster and more effectively, and command and control was enhanced. But the system also increased the time for pre-mission checks. Responses supported the need for units to have exercised collective missions from the planning phase to the consolidation and reorganization phase to learn the impact the LW systems has on operational tempo, command and control, and situation awareness.

The recommended NET program incorporated the same core 14-day POI that focused on individual skills in the institutional functional courses. However, after completion of this 14-day individual training period, four days were scheduled for unit collective training at the platoon and company levels, culminating in a Capstone Exercise, resulting in a total of 18 days.

Training Resources

Training resources were estimated for the functional courses, based on a target population of 7 SBCT. Yearly requirements for the Squad Leader alternative were 1195 students, 40 courses with maximum of 4 courses conducted simultaneously, a maximum of 20 instructors, and a maximum of 140 GSS systems. Yearly requirements for the Team Leader alternative were 1705 students, 40 courses with a maximum of 6 courses conducted simultaneously, a maximum of 30 instructors, and a maximum of 210 GSS systems. A 1 to 6 ratio of instructors to students was used. Ammunition requirements were also computed, with the Team Leader alternative requiring 1.8 times more rounds.

Given that the time to conduct the NET POI was estimated to be 18 days, a NET training cycle was determined to be one month in length. For each alternative, the strategy for sequencing the training with a brigade was determined, with company-size elements within the

brigade trained in a cycle. Four iterations of this cycle were required to fully train a brigade. For the Squad Leader alternative, 569 individuals had to be trained; for the Team Leader alternative, 812 individuals had to be trained. The squad leader alternative required fewer training resources such as instructors. As with the functional courses, ammunition requirements for the Team Leader alternative were almost twice that of the Squad leader alternative.

Analytic Techniques

The analytic techniques used in the training analysis reported in Appendixes A and B depended primarily on-site observations of LW NET in conjunction with focus groups and Soldier/leader surveys. The approaches used were not new, having been developed during ARI's prior research with the LW system. Multiple approaches to examining and understanding the training process had been applied with earlier versions of the LW system. The training analysis for LW NET reinforced this overall strategy. Some examples are cited to illustrate how prior work on LW impacted the analyses.

Prior research had shown the importance of observing training in order to understand training dynamics and to document the reactions and proficiency of Soldiers, leaders and units (Dyer, et al., 2000). Whenever possible, NET observations were used to document Soldier success in completing tasks during practice exercises. The actual time-on task data recorded during the NET observations were the basis for generating resource requirements for future NET. Prior ARI experimentation with reduced exposure firing (Dyer, et al, 2005) provided knowledge of the type of training Soldiers need to achieve proficiency with this LW system capability as well as the resource requirement. Work with the LW system used during the JCF AWE (Dyer, et al., 2000) yielded insights into the amount of training time and the sequence of training required for unit proficiency, as well as measurement issues related to the type of questions that work best when querying Soldiers and leaders regarding their attitudes toward a new system (e.g., confidence in their unit's skill with the system, proficiency with individual system skills).

Conclusions

The training assessment and analyses in this report plus similar, earlier training assessments and analyses provide a historical perspective on training requirements for the LW system and GSS. They highlight how these requirements changed over time with system development and as more information was gained about what constituted effective training. In addition, they provide an audit-trail of individual tasks associated with dismounted ground Soldier systems.

The assessment and research techniques have general applicability for program evaluations of training on other new Army equipment and systems. They show the importance of conducting on-site observations of training in order to clearly understand the impact of new equipment training. In addition, the techniques used for estimating training requirements and resources for units and within the institution are relevant to making similar estimates for other developing systems.

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Acronyms

AOA	Analysis of alternatives
ANCOC	Advanced Noncommissioned Officer Course
ARI	Army Research Institute
ATEC	Army Test and Evaluation Command
BOIP	Basis of Issue Plan
BNCOC	Basic Noncommissioned Officer Course
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities
DTT	Doctrine and tactics training
GSS	Ground Soldier System
IMI	Interactive multi-media instruction
IOBC	Infantry Officer Basic Course
JCIDS	Joint Capabilities Integration and Development System
JROC	Joint Requirements Oversight Counsel
LUT	Limited User Test
LW	Land Warrior
MW	Mounted Warrior
NET	New equipment training
ORD	Operational Requirements Document
OSUT	One Station Unit Training
PE	Practical exercise
PM-LW	Project Manager-Land Warrior
POI	Program of instruction
SaaS	Soldier as a System
SBCT	Stryker Brigade Combat Team
SER	System Evaluation Report
STRAP	System Training Plan

TRADOC	Training and Doctrine Command
TRAC-WSMR	TRADOC Analysis Command-White Sands Missile Range
TCM-Soldier	TRADOC Capabilities Manager-Soldier
TSM-Soldier	TRADOC Systems Manager-Soldier
USAIS	United States Army Infantry School

Note. Appendixes A and B contain the reports as submitted to support the LW and GSS Analysis of Alternatives. Table numbers and figures are the same. However the page numbers were changed to be consistent with guidance for numbering of Appendix pages in ARI reports.

APPENDIX A

LAND WARRIOR NEW EQUIPMENT TRAINING (NET) ASSESSMENT

Land Warrior New Equipment Training (NET) Assessment

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Land Warrior New Equipment Training (NET) Assessment

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Land Warrior New Equipment Training Assessment

Background

Assessment Objectives

The Land Warrior (LW) New Equipment Training (NET) assessment was one part of the LW DOTMLPF (Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities) Assessment directed by the Training and Doctrine Command (TRADOC, 2006). The study will provide a DOTMLPF assessment to inform the Vice Chief of Staff of the Army and a potential LW Milestone C decision in FY07. TRAC-WSMR (TRADOC Analysis Command, White Sands Missile Range) was the designated lead analytic agency for the assessment. In turn, TRAC-WSMR requested that the U.S. Army Research Institute (ARI) be the lead analytic agency for the NET assessment which was part of the overall training assessment.

The LW NET assessment fell under the broad study issue in the LW DOTMLPF assessment which stated (TRAC, 2006): "What are the DOTMLPF, logistics, and communications impacts of fielding Mounted Warrior (MW) and alternative LW BOIs [basis of issue]?" A subordinate essential element of analysis (EEA) stated: "What are the training and leader development impacts of fielding MW and alternative LW BOIs?" The NET assessment specifically addressed **two MOEs (measures of effectiveness) under this EEA:

- Sufficiency of the NET Program of Instruction (POI) for LW BOI study Alternative 1
- Recommended NET POIs for each LW BOI alternative.

The two study alternatives were:

- Alternative 1: Base case plus LW down to all Soldiers in the Stryker rifle squad and squad leaders (SLs) and assistant gunners in the Stryker weapons squad. SLs and Forward Observers (FOs) have the STORM-MLRF (small tactical optical rifle-mounted micro-laser range finder).
- Alternative 2: Base case plus LW down to team leader. SLs and FOs have the STORM-MLRF.[1]

In the summer of 2006, a Stryker Battalion from the 2nd Infantry Division at Ft. Lewis, WA was equipped with the LW system. The LW systems issued to this Battalion corresponded to the BOI as specified in Alternative 1. LW NET was conducted during the summer as well. Since Alternative 1 corresponded to the LW BOI that existed during this NET, the first objective or MOE addressed the sufficiency or adequacy of the NET POI that was actually conducted with the Stryker Battalion.

[1] Throughout the remainder of this report the phrase "STORM" will be used when referring to the "STORM-MLRF".

The second MOE or objective was to define the optimum NET POI for each of the three LW BOI alternatives. The optimum NET POI for Alternative 1 was based on the results from the first objective or MOE. The optimum NET POI for the other two BOI alternatives was extrapolated from findings regarding the optimum NET POI for Alternative 1.

Results for each study MOE are presented in separate sections of this report. The report does not address the MW NET.

Land Warrior System

The LW system is a dismounted Soldier system that provides digital communication, and battle command capabilities, situation/tactical awareness, and additional lethality capabilities to the small-unit. It also allows the Soldier to communicate with the crew in the Stryker vehicle (U.S. Department of the Army, 2006a; 2006b).

Several technologies are central to the LW system, and are integral to the body, weapon and helmet subsystems. A Soldier has a computer that is on a local area network (LAN), and has a global positioning system which, in conjunction with the computer, allows the Soldier to see himself and others in his unit on a map display. The computer and LAN enable messages, overlays and orders to be created and transmitted. The map display and other software screens are viewable via a helmet-mounted display (HMD). Soldiers have voice ("radio") communications. In addition, a cable link to optics on the weapon enables the Soldier to see a digital image of the battlefield on the HMD. This capability also allows him to detect and engage targets from a reduced exposure position. The Soldier operates his system through control devices on his body subsystem and on his weapon.

Figure 1 is a photo of a leader wearing the LW system in December 2005. Clearly visible is the HMD over his left eye. He is operating a control device, called the Soldier Control Unit (SCU) with his left hand. On his M4 carbine is the light thermal weapon sight (TWS), which is linked via a cable to his computer, enabling the TWS image to be shown on his HMD.

Figure 1. Picture of LW system as of December 2005.

Definition of NET

NET is defined as training to prepare commanders, leaders, trainers, users, and maintenance personnel during development and fielding of new equipment. It includes training to prepare commanders, staff, and junior leaders to fight with new weapons and equipment (TRADOC Pam 350-37, US Department of the Army, 2003, p. 76). Further, NET is to accomplish the transfer of knowledge on the operation, maintenance, and DTT (Doctrine and Tactics Training) associated with fielding of new, improved, or displaced equipment from the materiel developer to the tester, trainer, supporter, and user (TRADOC Regulation 350-70, US Department of the Army, 1999).

Analysis Guidance and Plan

Broad guidance for the NET analysis was given in a memorandum of instruction (MOI) by the US Army Infantry School (USAIS, 2006, reflects *Study Issue 2 of the* MOI on the *Execution of the Training Impact Methodology)* and coordinated with members of the study team. Specifically, the analysis should provide recommendations for "a NET POI that when executed, successfully trains Soldiers to operate and maintain the system and leaves the unit in a situation where they can conduct sustainment training on the system. In developing the optimum NET POI, the focus should be on conducting the necessary training, and not constrain the NET to a pre-specified period of time." (p. 4).

The MOI also specified the scope of the analysis/study regarding DTT. "LW and MW inherently require DTT in addition to classic NET to maximize the utility of the systems and set the unit up for future collective and mission type training and operations. The unit being assessed will develop tactics, techniques and procedures (TTP) during the [DOTMLPF] assessment; therefore no tactical training was presented [during NET]. Regardless, any

development of a new LW/MT NET should address DTT, as the recommended NET POI will be executed for future units." (p. 5).

Consistent with the MOI, an optimum NET POI was viewed as an approach that would lead to a high level of expertise, both individual and collective expertise. A recent Defense Science Board (Braddock & Chatham, 2001) examined the topic of training superiority. Several conclusions from this report that stress the importance of training were directly relevant to the NET assessment/analysis. One was the general conclusion that *"Warfighting success is as dependent upon the proficiency of people as it is upon the hardware with which they fight"* (p. 25). With respect to maximizing the effectiveness of military equipment, the DSB report concluded that *"Inadequate and poorly timed training can negate the technical superiority of our hardware"* and that *"training failure will negate hardware promise"* (p. 24). Also, the consequences of the failure to assess training were stressed. *"We don't count training. We measure process, not proficiency. What you don't measure or report, you can ignore"* (p. 25).

Other factors that impacted the NET assessment was the experience of research scientists from the ARI with training on previous versions of the LW system (Caliyo et al., 2005; Dyer, 2004, 2006; Dyer et al., 2000), and experimentation with reduced exposure firing with the system (Dyer et al., 2005). In addition, in 2006, a training impact analysis was done for the Land Warrior Block II system as part of the larger TRADOC analysis of alternatives study (Dyer, Centric, & Dlubac, 2006).

A study plan was developed to support the training EEA. It included references to be used; and study constraints, limitations and assumption. Details on all MOE and MOP (measures of performance) under the training and leadership EEA were presented. The proposed methodology for the analysis was outlined as well as study milestones.

MOE 2.3.3: Sufficiency of the NET POI – Training Observations

The following measures of performance (MOP) supported the MOE that addressed the sufficiency of the NET POI.

- NET resources for the LW BOI (planned, actual, desired).
- Skills and tasks trained in NET POI (skills/tasks planned to be trained, actually trained, appropriateness of skills/tasks trained).
- Training effectiveness (quality of individual and collective task trained, tasks that required more training after NET).

To examine the MOE on the sufficiency of the NET POI for the LW BOI Study Alternative 1, the following data sources were used:

- The LW NET POI, lessons plans, training support materials.
- Results from formal observations by subject matter experts (SMEs) and the corresponding records of LW NET at Lewis. The observations included the three initially planned, nine-day NETs for each of the Stryker companies, as well as one additional follow-on, five-day NET that was conducted to ensure all Soldiers had been trained.
- Results of a Soldier performance test given during NET.
- End-of-course Soldier surveys on the NET POI given immediately after NET.
- Soldier surveys regarding training given after the completion of unit training, approximately 4 months after NET.
- Focus group session results.
- Lethality experiment results.
- NET instructor interview results.
- Results from prior experiments with prototypes of the LW system.
- Input from the US Army Infantry School's LW training representative.
- Army Test and Evaluation Command, System Evaluation Report for the Land Warrior System (ATEC SER).

In reporting the formal observations of training, observer comments and reactions are labeled as "*Observer comments*" to distinguish subjective reactions and discussion points from the description of what was actually observed. The "*Observer comments*" paragraphs are included in the appropriate subsections of the report, rather than consolidated at the end of the entire section on training observations.

The following limitations apply to the NET observations:

- Complete observations of all three initial iterations of the LW NET at Ft. Lewis (Alternative 1) could not be conducted due to resource limitations.
- There was only one observer for each NET, which made it impossible to observe all activities when simultaneous training occurred. In addition, it was not possible to cross-check the observation data obtained for each NET.

The following assumptions were made regarding the NET assessment

- The three iterations of the initial LW NET were executed similarly; results from observations of one NET will apply to the other NET iterations.
- Soldier/leader responses to the follow-on LW NET were expected to differ from responses to the initial NET iterations as the time was limited to one week, the class size was smaller, and the ratio of trainers to Soldiers differed.

In accordance with the MOP, this section of the report addresses the following questions regarding the sufficiency of the LW NET:

How was user NET conducted? What resources were required? Were the objectives of the POI met?
Were all individual tasks specified in the POI trained to the desired level of proficiency?
Should training on any other individual tasks, Soldier and/or leader, be added to NET; should any be eliminated?
What methods of instruction/resources should remain the same; what should be modified and what are the recommendations for modification?
What level of individual proficiency is required for LW-NET? Should changes be made to the criteria? If so, what changes?
Should any additional collective training exercises, be added? If so, what types of exercises are desired and to what level of proficiency?

Overview of LW Nine-Day NET

NET Plans

The assessment of the sufficiency of NET provided to the Stryker Battalion participating in the LW/MW DOTMLPF assessment must be put in context. NET plans had to be changed several times due to constraints placed on the NET team. In essence, unexpected changes in planned time, training facilities, and equipment delivery impacted NET execution. A summary of the major changes is presented here.

In July 2005, a year prior to the actual NET, the plan was for a five-week NET. This included a two-week operator course for everyone, a one-week follow-on leader course which included Mission Data Support Equipment (MDSE), and two weeks of collective training.

Due to limited funds for the NET team (NETT) and limited unit time, this plan was changed. The total training time for a Company was reduced to 9 days not to exceed 70 hours. The plan also was to conduct the three (3) Company NETs in sequence and use three 50-man classrooms for each NET. MDSE training (32 hours) for Company commanders, platoon leaders, and individuals from the S1, S3, and S4 sections was planned to precede the NET training. This training was necessary for preparation of orders and overlays for collective exercises, transmission of them to unit personnel, loading other required features of the mission data package (MDP) such as maps, and default message and situation awareness (SA) settings. Training was also necessary on how to create the Soldier access module (SAM) cards. In addition, the unit was to develop TTP.

Later, further constraints on time and facilities were placed on the NET team prior to execution of NET. Specifically, the unit indicated there was only five weeks to conduct the entire NET for the battalion. This five-week period included several non-training days because of Memorial Day and unit reflagging. This change in schedule meant that the three Company NETs had to overlap. The only facility available was a large maintenance building which could support about 120 individuals, not three 50-man classrooms.

Just prior to NET and during NET, two other changes occurred with regard to training time and the NETT's responsibilities. These changes occurred after the POI and lessons plans had been submitted to the government. The unit indicated that the daily start time would be 0900 because of PT. The POI had specified the start time to be 0800. In addition, the company indicated that they wanted to be in charge of the last day of training, and planned a company attack as the culminating event. These changes resulted in a 55-hour NET to be led by the NET cadre in contrast to the 70-hours of cadre-led NET that was planned.

NET Execution

The Stryker Battalion participating in the LW/MW DOTMLPF assessment and in the Limited User Test (LUT) held in September 2006 attended a nine-day NET. The training was conducted at the Company level in three consecutive, sometimes overlapping iterations of NET. Table 1 displays the sequence and dates of training.

Table 1
NET Training Sequence and Training Dates for Each Company

May													June										
15	16	17	18	19	22	23	24	25	26	29	30	31	1	2	5	6	7	8	9	12	13	14	15
T	T	T	T	T	T	T	T	T															
					R	R	R	R			R			R	R	R	R						
															S	S	S	S	S	S	S	S	S

Note. May 26 and 29 were training holidays associated with Memorial Day. May 31 and June 1st was reflagging. Consequently, the training for R Company was spread out over a three-week period. Arbitrary letters have been assigned to the companies.

The entire Company attended the same training. Thus the Company leadership received the same instruction as the other unit members. In addition, each iteration of the NET included members from the battalion staff, and/or personnel from the medical, recon, engineer, and field artillery elements. The number of individuals who completed the performance evaluation at the end of the first week of training was as follows: T Company = 94; R Company = 101; S Company = 98.

Each NET was observed to varying degrees. Complete, formal observations were made of the entire S Company NET. Complete formal observations were made of the first week of R Company NET. Partial observations were made of the NET for T Company and for the second week of R Company.

The overall execution of the nine-day NET was similar for each company. The first week consisted of five days of classroom training, including the performance evaluation on the software interface, and was conducted in a large classroom that accommodated the company-sized units. Figure 2 shows the classroom setting. There were five rows of tables with three tables per row plus one extra table.

Figure 2. Classroom used during Week 1 of the nine-day LW NET.

The Soldiers were organized by platoon and squads within each platoon, such that each squad sat at one table. For example, S Company had a total of 12 squads plus a company leadership group and a battalion leadership group. R Company had nine squad tables, three platoon tables, a company/battalion staff table, and a table each for medics, snipers, and recon squad. The Soldiers also participated in squad-level practical exercises (PEs) conducted by assistant instructors (AIs) outside the classroom building. Figure 3 shows one AI conducting a

PE with a squad. There was one primary instructor who led the classroom instruction and demonstrations of the key material. There were 16 AIs, with an AI assigned to each squad or table which allowed a ratio of one (1) AI per nine (9) Soldiers for each Company NET. For each NET, the AIs administered the performance evaluation.

Figure 3. Squad PE during Week 1.

The second week was field training which was conducted at two different firing ranges and a military operations in urban terrain (MOUT) site called Leschi Village. There was a shift in focus to marksmanship skills, land navigation, and system employment. Soldiers boresighted and zeroed their weapons and conducted familiarization firing on the ranges. The area surrounding the MOUT site was used for day land navigation exercises with the system. The Soldiers also practiced squad movements in the area surrounding the MOUT site. The second week of training culminated in either a platoon or a company attack at Leschi Village. The unit determined that they would be responsible for planning and executing the squad- level movement and culminating attack field. Week 2 training was observed formally for only S Company.

For Week 2 training, there were 12 NET instructors/trainers (called the "Field Team"). On the two days in which the company was divided between familiarization firing and land navigation/small-unit movement formations, the plan was for these 12 instructors to be divided into two groups of six each. In addition, for the performance test which was conducted the first week, six instructors were drawn from the Field Team in order to execute the performance test in a timely manner, making a total of 23 instructors. Some modifications from these planned

numbers of AIs were observed with C Company, but the Field Team was split between these periods of training as planned.

> *Observer comments.* It is important to note that during the first week of NET, the class size was large and diverse. For example, duty positions ranged from rifleman to battalion commander and his staff. Medics, engineers, field artillery, recon, and Sniper personnel also attended. Different duty positions have different components of the LW system, and/or have different responsibilities. Only selected leaders (squad leader and above) have the STORM. Selected team leaders have the TWS. Only senior leaders develop orders and the associated tactical overlays. In addition, the large classroom was the only facility available. These conditions prevented tailoring the training or the testing (on system operation) to the distinct segments of the target population.
>
> Another general comment is that system unreliability and network communication problems hindered the NET, although constant improvements were made throughout the five-week training period to improve system reliability and functioning. Also, as might be expected, lessons learned from previous NETs regarding system functioning and training sequences, techniques, and/or procedures were applied to later NETs.
>
> Although the large classroom was not optimum for Week 1, the training areas and ranges were sufficient to conduct the training during Week 2. In addition, it appeared that there were sufficient instructors available to help demonstrate the system, conduct performance evaluations, and troubleshoot the equipment.

An additional compressed NET was scheduled (July 10-14), as not all personnel were able to attend the initial company-scheduled NETs. This was a five-day NET, with a smaller class size of 28 battalion personnel, which was a cross-representation of personnel from different duty positions and companies within the battalion. The focus was primarily on LW operation; the performance exam was given. There were no collective training exercises. The marksmanship training was limited to boresighting and zeroing, and the individual land navigation course was shorter than the nine-day NET. There were nine instructors for this NET. One person observed this NET. It is described in a separate section that follows the presentation of the training observation results from the nine-day NET.

Terminal Learning Objectives

The NET POI (Omega Training Group, 2006) specified the Terminal Learning Objectives (TLO) and Enabling Learning Objectives (ELO) and the time allocated for each TLO/ELO (see Table 2). The TLOs are categorized by the week in which the training was conducted.

Time Allocated for Training Objectives

A summary comparison of the planned, available, and actual times is in Table 2. Planned times are based on times for the TLOs as specified in the POI and the lesson plans. The allocated time was based on a 7-hour training day. It was not an 8-hour day because unit physical training time meant that training started at 0900.

Tables 3 and 4 that follow show a more detailed break-out of the times allocated for the TLOs in the POI as well as the actual training times. The times in Table 2 are based on Tables 3 and 4. All the planned TLOs were covered in the nine-day time period, although the execution varied somewhat for the three NETs.

Table 2
NET Time Summary and Comparisons

Training Period	**Planned Time**	**Allocated Time**	**Actual Time**
Week 1	41 hrs (2,460 min)	35 hrs (2,100 min)	T Co: 33 hrs 33 min (2,013 min) S Co: 32 hrs 58 min (1,978 min)
Week 2	29 hrs (1,740 min)	28 hrs (1,680 min)	S Co: 17 hrs 29 min (1,049 min)
Total	70 hrs	63 hrs	S Co: 51 hrs (3037 min)

As indicated in Table 2, in Week 1, in comparison to the 70-hour POI, actual times were 7 to 8 hours less than the planned times. Second, given the unit constraint of starting the training day at 0900, there were actually 35 hours available for NET during Week 1 (7 hours per day for 5 days). Actual times were 1 ½ to 2 hours less than the maximum time available.

As shown in Table 3 for Week 1, the actual times were relatively consistent across the three companies. The slightly lower time for R Company for the TLO of Operate the System resulted from an unexpected 1 ½ hour delay in unit arrival on Day 3.

The second week was observed for only one company. For this company the total actual time 17 hours 29 minutes (1,049 minutes) less than the planned time; the difference being 11 ½ hours. This time pattern was consistent with Week 1.

Table 3
TLOs for the LW NET and Associated Times for Week 1

Approx. Schedule	TLO	POI Times (Minutes)	Execution Times by Company[a]			
Week 1		***TLO***	**T**	**R**	**S**	
Day 1[b]	Lesson 1001: Identify LW components and capabilities	60	44	42	40	
	Lesson 1002: Assemble the LW system	120	168	193	268	
Days 2-4[c]	Lesson 1003: Operate the LW system	1,620	1,152	1,057[k]	1,129	
Day 5[d]	Lesson 1010: Familiarize with LW support equipment	Support Equip. 300 VIK/Battery Chargers; CDA;MDSE; Ingress/Egress [e] Intro/Summary	UK	UK	Support Equip. 127[f] VIK/Battery Chargers (85) CDA (25) MDSE (17)	Support Equip. + Perf. Eval. for the Entire Company 300[g]
	Conduct LW performance evaluation	180	Perf. Eval. + Maint. for the Entire Company 400[h]	UK	(120)[i]	
	Lesson 1013: Maintenance & Troubleshooting Procedures	180		UK	55	
	Senior Briefings/ Administrative Breaks+Delays[j]		20/229	15/227	13/173	
Total Time for Week 1		2,460	2,013	UK	1,978	

Note. UK = unknown; no observer present for the entire training event. Times do not include lunch. POI times include breaks; whereas actual break times have been totaled for the week for each company.

[a] Companies are reported in the order in which they received the NET.

[b] Day 1 included instruction on donning and powering up the LW. The times for these topics are included in the Operating the LW TLO.

[c] Time to review the performance evaluation was included in the operate times as it overlapped with the purging and loading the MDP PE.

[d] Familiarization with LW support equipment was a round robin event with the performance evaluation. The MDSE was a round robin event with the CDA class after the VIK/Battery charger class.

[e] Ingress/Egress training was not observed for any company.

[f] Only one class for each TLO was observed.

[g] The total time to complete the round robin for Support Equipment/Performance Evaluation (300) was included in the total time for Week 1.

[h] The separate times for the Performance Evaluation/Maintenance class were not recorded.

[i] The 120 minutes represents the estimated time to complete the Performance Evaluation for the first 78 Soldiers. There were 18 stations each with 4 Soldiers (tested in pairs), and 2 stations each with 3 Soldiers. Each pair took about 45 minutes. The introduction was about 30 minutes.

[j] R Co break times are lower because Day 5 was not observed. R Co times for Operate are lower because of an unexpected 1 1/2 hour delay in starting on Day 3.

Table 4
TLOs for the LW NET and Associated Times for Week 2

Approx. Schedule	TLO	POI Times in Minutes	Execution Times by S Company	
Week 2				
Day 1	Lesson 1005: Boresight LW weapon subsystem	120	(211)[a]	Boresight + Zero for the Entire Company 462[b]
	Lesson 1006: Zeroing	180	(335)[a]	
Day 2	Lesson 1007: Day Land Navigation	240	143	
	Lesson 1014: Formations and Orders of Movement	240	160	
Day 3[c]	Lesson 1006: Familiarization Firing with the LW weapon subsystem	480	188	
Day 4	Lesson 1004: Employ LW system (plan, prepare, execute a mission)	360	96[d]	
	Conduct LW After Action Review	120	UK	
Total Time for Week 2		1740	1,049	

Note. UK = unknown; no observer present for the entire training event. Informal observations showed that boresighting and zeroing required an entire day for R and T Companies.
[a] Boresighting overlapped with zeroing. Range, boresight equipment, and time restrictions did not allow everyone to complete boresighting and then progress to zeroing. As a Soldier completed boresighting, he then progressed to the zero range. Thus some Soldiers were boresighting as others were zeroing.
[b] The total time the company took to complete boresight/zeroing (462 min) was included in the total time for Week 2.
[c] Days 2 and 3 was conducted in a round robin fashion. Familiarization firing occurred on one day; land navigation, and formations and orders of movement occurred on the other day. Only one platoon was observed as it progressed through this training sequence.
[d] S Company received the OPORD prior to Day 4. So the time for the company on Day 4 does not include "planning and preparation," only mission execution. Also the Soldiers received new keys before the exercise which delayed the start time. The recorded start time in this report is when the Strykers arrived at the training site.

Actual time similar to planned time. The planned and actual times were similar for one TLO. This was identify LW components and capabilities.

Actual time exceeded planned time. Actual time exceeded planned POI times for four TLOs: system assembly, performance evaluation, boresighting, and zeroing. Assembling the system took 1.4 to 2 times longer than planned. All Soldiers had to have helmet and body subsystems that fit. The most common problem was body subsystems that were too small. When possible, Soldiers swapped systems with each other to obtain better fitting systems. However, some Soldiers had to be refitted with new systems. Soldiers in all the companies had to assemble the weapon subsystem (configuration varied with the duty position), configure their helmet to include the Peltor headset, attach ammunition/first aide pouches, etc. This process took longer than expected. In addition, more time was required for S Company due to a newly established unit standing operating procedure (SOP) requiring the Soldiers to move the system

components to the back of the body subsystem to accommodate ammunition pouches in the front.

The performance evaluation took 1.7 to 2.2 times longer than planned. However, the actual time decreased from the first to the final NET iteration as the method of testing was modified to evaluate more Soldiers in a shorter period of time. The evaluator to student ratio was changed from 1:1 to a 1:2 after the first NET (T Company).

Finally, S Company unit took longer to boresight and zero the daylight video sight (DVS) and the TWS than planned. No precise time data were available for boresighting and zeroing for the other Companies. However, informal feedback from other observers as well as feedback from the trainers, indicated that boresighting and zeroing required an entire day. In addition, the boresighting and zeroing processes were hampered by inclement weather for T Company. In summary, it required an entire day to complete both tasks for each company, as compared to the planned 5 hours in the POI.

Observer comments. Interviews with the key NET instructors clarified why assembly time was longer than expected. Given that Soldiers had been measured previously, the problems with the smaller than expected sizes with the body subsystem were not expected when it occurred with the first NET (T Company). The problem was systematic, however, and the resultant long times for system assembly continued throughout the other NET iterations. In addition, there were problems with the helmet, as not all Soldiers had the proper helmet which was the advanced combat helmet (ACH).

Regarding the longer times for zeroing and boresighting, informal feedback indicated that many Soldiers in the companies were inexperienced and that this factor had a negative impact on boresighting and zeroing times. The longer time may have been due in part to the limited number of boresight kits available during the training and/or to the fact that platoons staggered their start times.

The longer times for these blocks of instruction illustrate the impact of equipment status on training time as well as the experience level of the Soldiers.

Actual time was shorter than planned time. The training times for seven of the TLOs were shorter than the time allotted. One of these was "Operate the LW." A total of 27 hours was planned; more than three days regardless of whether the training day was seven or eight hours. Operate the LW was the primary focus of the first week of NET and was conducted between two other mandatory, required periods – assemble the system and the performance test; like a sandwich. The longer time for these two periods of instruction "cut into" the time that remained for training on system operation. In addition, there were unexpected administrative breaks that reduced the time – special company events that delayed the start time for a given day, debugging of the communications network, etc.

Further during the first week, the Maintenance and Troubleshooting Procedures, and Familiarize with the Training Support Equipment training were both conducted in about half of the planned time.

For the second week, the training times for the Familiarization firing with the LW weapon subsystem, Land Navigation, Formations and Orders of Movement (FOOM), and the culminating Employ the LW system field exercise were shorter than planned.

Most of the NET training was hands-on. However, during the first week, there were formal lecture-type sessions which were followed by PEs to provide Soldiers hands-on experience. The times for the PEs and the lecture are shown for each NET in Table 5 for the primary block of instruction conducted in Week 1 – operate the system. In general, twice as much time was spent in PEs as was spent in lecture.

Table 5
Practice Exercise and Lecture Times (minutes) for Each Company NET for the Operate System TLO

Week 1: Operate System	**T**	**R**	**S**	**5-day**
Practice Exercises	827	676	764	361
Lecture	431	371	380	241
PE to Lecture ratio	1.9	1.8	2.0	1.5

Week 1: Summary of Training Observations

System Overview

Either the Battalion Commander or the TRADOC System Manager (TSM) -Soldier briefed the companies regarding the advantages of the system and purpose of the training. They asked for the Soldiers' feedback for changes to the system, appropriate basis of issue, and TTP.

The principal instructor (PI) reviewed the TLOs for the course and then described the LW system and each subsystem. This presentation was supported by PowerPoint slides showing each component. This presentation included such factors as the weapon devices, batteries, cables, the software operating system, the radio, and navigation subsystem. Support equipment such as the vehicle integration kit (VIK), battery chargers, MDSE, and connection to the lower tactical internet were briefly described.

Lastly, the major capabilities of the system were described to include SA --- where am I, where are my buddies, where is the enemy, what am I supposed to do. Advantages of the system for shooting, moving, command and control, communication, fire support, protection and sustainment were presented.

System Assembly

During the overview section of the course, the Soldiers had already seen and become aware of the components of the LW. During system assembly, the PI presented slides on the assembly procedures and subsystem checks. The system assembly instruction included demonstrations and PEs on the helmet, body, and weapon subsystems. The AIs assisted individuals during the entire system assembly process.

Soldiers were instructed on how to assemble the body subsystem, and then they assembled their own body subsystems. During each NET iteration, additional time also was required to resize some individuals with the proper body subsystem. When sizing issues occurred, they were typically because the Soldiers needed a larger size. Left-handed Soldiers were given guidance on how to configure their SCU for left-handed firers. Feedback from Soldiers participating in the first two iterations of the NET prompted a SOP by the unit to move the computer system and batteries to the rear of the body subsystem. Thus, during the last iteration, additional time was devoted to moving the system components.

Soldiers used their own Advanced Combat Helmets (ACHs). Time was devoted to installing the Helmet Interface Assembly (HIA) into these helmets. Some Soldiers had Kevlar helmets and had to be issued the correct helmets while other Soldiers took additional time assembling their helmets because their ACHs were not compatible with the HIA. This assembly process also included connecting the Peltor headset.

Soldiers also received instruction on and assembled the weapon subsystem. The weapon devices and attachments varied with the duty position. For example, only selected leaders had the Small Tactical Optical Rifle Mounted Micro Laser Range Finder (STORM); only selected

individuals had the TWS. The weapon user input device (WUID) was designed differently for the M4 carbine and the M249 squad automatic weapon. The sequence of connecting cables, attaching brackets, placing the devices on the proper location on the weapon rail, etc. had to be followed carefully.

At the end of this block of training, Soldiers donned the entire LW system. They also received instruction on emergency doffing of the system but did not execute this procedure.

> *Observer comments*. As explained previously, the increased time for this period of training was not expected. Sizing is important, and the additional time needed to fit Soldiers appropriately was required. The body subsystem includes various components and cables. Soldier comfort is critical; Soldiers need to be able to breath. Even small-sized individuals may desire a larger-than expected size because of these factors. In addition, a large size allows Soldiers to tailor/adjust, within limits, to their body/chest configuration. It may be advisable in the future to conduct a measurement study and compare results to what size Soldiers prefer in order to design systems appropriately and /or to provide guidance to Soldiers on what sizing information they should provide the LW program management.

System Operation

Most of Week 1 was devoted to system operation. In general, the classroom training was structured such that the information on a given topic or task or procedure was presented first followed by a demonstration by the PI, or the demonstration was accompanied by the PI's description of the procedure. The demonstration was accomplished by having a break-out box that displayed the software interface on two large screens in the classroom (see Figure 2). All individuals were presented this information. Then, a PE was conducted, typically outside, that allowed Soldiers to apply the material and practice the task(s). Each PE was conducted at the squad-level (table groups of 9 Soldiers) by an AI. AIs had short checklists that indicated what they were to cover in the PE. In addition, at the start of the PE, many AIs repeated the information disseminated by the PI. The general policy, as explained by the PI, was to have a 50-minute training session (instruction or PE) followed by a 10-minute break.

Each Soldier attending the NET was provided with an *Operator's Guide*, a *Quick Reference Card* (see Annex A for a table of contents for these documents), and a copy of the briefing slides. All were printed in black and white. The following paragraphs provide an overview of the LW tasks and information regarding system operation covered in the NET. The overview is presented by topic, not necessarily by the sequence in which the training was conducted, as there were some slight variations across the three companies.

Training on system operation included the following topics:

- Operate the SCU
- Start-up procedures and shut down procedures: power on, log on, and log off
- Configure the LW system (without navigation)
- GPS/DRD (global positioning system/dead reckoning device) functions/calibration (navigation calibration)

- Map functions
- Plotting and editing of a symbol
- Digital communications: call for medic, SALUTE, free text
- Voice communications
- Operate the WUID
- Operate the DVS
- Characteristics and operation of the light and medium TWS
- Operate the STORM
- Field functionality test
- Image editor
- MDP management
- Mission planning

The following PEs were identified in the POI:

- Power on, login, and power off
- Configure the system (except for navigation subsystem)
- Configure navigation subsystem.
- Map functions
- Digital messaging
- Operate the weapon subsystem
- Conduct voice communications
- Call for and cancel call for medical assistance
- Field functionality test
- Image editor
- MDP management, help and system log
- Mission planning

***System start up and configuration*.** For the first two companies that received NET, the batteries were located on the front of the load bearing equipment (LBE). To log-on, Soldiers scanned a SAM card (a card the size of a credit-card) on the bottom of the SCU, which was located on the front of the LBE. However, for the third Company the new SOP of moving the computer and batteries to the back of the LBE caused the trainers to implement a new procedure for powering up the system. Soldiers were instructed to power up in buddy teams so that one Soldier assisted another in pushing the power button for three seconds; which then allowed the Soldier to scan his SAM card.

Once logged on, each individual must configure his system or check his configuration. The configuration menu is on the Main Menu drop-down list. The PI covered all configuration settings on this menu. They appear on the configuration screen display in the following format as shown in Table 6. A brief description of some of the settings (in italics) is also shown in Table 6.

Table 6
LW Configuration Menu

Alerts *[audible and visual]*	Sighting Device *[DVS reticle]*
Filter Friendly SA	Messaging
MFL *[not yet integrated in system]*	CNRS radio *[power settings]*
Routes/waypoints [*not available]*	SCU *[set-up for left-handed individuals*]
Talk buttons	Time *[local and Zulu]*

Note. " MFL" stands for multi-function laser i.e., the STORM.

The Alerts, Time, SCU, and Communications Network Radio Subsystem (CNRS) configurations were described briefly; how to configure these settings is almost self-explanatory. Most of the PI's time was spent on how to select individuals to display on the map via the Filter Friendly SA function, how to select individuals for recipients of digital messages, how to configure talk groups, and how to configure the DVS reticle.

Although there are default settings for SA, talk buttons and messages, the class was taught how to change these settings. The PI indicated that eventually the unit will provide guidance/SOP regarding what should be done by echelon, by mission, etc. One constraint mentioned was that there are only two talk groups available for each individual. The PI demonstrated the procedures for configuring a system with respect to each of these three functions. All these configuration settings had to be explained and demonstrated, as they differed slightly from each other. The procedures were not identical, and they were not self-explanatory. Basically, the Soldier has access to the entire list of individuals within the battalion who have a LW system, and can sort/search this list to identify and then select to whom he wishes to talk, send a digital message, or display on his map.

The PI reviewed the three fields of view available on the DVS (1.5x, 6x and 12x power). He also showed the three reticle types (black, white, and reverse). He also explained/demonstrated how the reticle can be adjusted for windage and elevation during zeroing.

Also described were short-cuts to some of the configurations. Short-cuts did not involve the main menu but instead used a tool bar at the bottom of the screen that was always present. The short-cuts described related to the talk buttons, SA filter, error log- bottom click on the SCU to get to alerts, and checking battery power.

The PEs that were observed on system configuration varied with the AI. For example, one AI spent considerable time on the log-on procedures and system check because of the system reliability problems being experienced at the time. The AI elaborated on the function of the Filter Friendly SA and had each Soldier change this setting once. The rationale for the talk group settings was described again; that is, squad members only allowed to talk to the squad – have one talk group; however, the squad leader has two talk groups. The number of the talk groups was disseminated to the group. No one in the group observed conducted an exercise on changing the talk group settings, including the squad leader. No exercises were conducted regarding selecting recipients for digital messages nor on the DVS reticle (DVS reticle PE was conducted later).

For S Company, portions of the configuration PE were observed for two different groups. One AI reviewed the alerts and LW Built-in Test (BIT) failure configuration screens and then had the Soldiers change their filter friendly SA configurations. He explained that the SAM card provides a default setting for the buddy icons; default is based on the Soldier's role. For the rifleman this setting is one up and two down. He explained that when specific Soldiers are selected to appear on the map that the names appear gold in color on the list. He had them practice deselecting the names, which turned the names gray in color, and then had them look at their maps to see that these individuals now would not appear on the map. Finding specific individuals in the long list of names for all in the battalion (approximately 400 names) can take time, so the instructor taught the Soldiers a way to quickly reconfigure the filter friendly SA. He explained that everyone in the battalion with a LW system was given a four-digit unit reference number (URN). The list of names can be sorted according to this number. He said it is much easier to find your buddy's URN number than his name. He explained that they could find their URN by looking at the "from" field of a free text message; the last four numbers is their system number. Then, he instructed the Soldiers to work in pairs to identify their URN, find their buddy's URN on the list, and select the buddy to be seen on the map. As the Soldiers practiced these steps, the AI provided additional details as needed by the Soldiers. The step-by-step instructions were as follows: Configure Filter Friendly SA; search for individuals by finding URN (Search now, Show results, URN column, Scroll down and find buddy – click gold). He asked them how many people were gold and instructed the Soldiers to turn everyone else gray. He reviewed that SA helps answer the questions – where am I; where is my buddy; where is the enemy, and what am I supposed to do. Finally, the AI reviewed the information for the talk group configuration. He explained that the Soldiers are not able to expand the talk groups and that the system won't tell you who is on - similar to SINCGARS (Single channel ground and airborne radio system) – only a frequency. Talk button one is to communicate with higher; talk button two is used to communicate with lower.

The second AI for this Company instructed the Soldiers to configure everyone in the squad. He explained that everyone doesn't see everyone in the default. He instructed the group to select the squad leader, team leader, and everyone in the squad. He also reviewed how to adjust the reticle in the wide and narrow fields of view when zeroing and that the "center reticle" menu selection zeroes everything out so the Soldiers need to remember their zero numbers. He summarized the activities of the PE on configuration: Alerts; Talk buttons; SA filters; Sighting device; SCU (left-handed); Time.

> *Observer comments*. The PE observations showed a trend that continued throughout the NET – what was stressed and practiced varied with the AI even though they had guidelines regarding the PE. Consistency across multiple AIs is very difficult to achieve; AIs must also address the specific questions raised by individuals in the group, and groups progress at different rates. However, it might be helpful when a variety of tasks is to be trained, that the AI guidelines specify which ones are the most critical and must be practiced. This could enhance consistency and ensure the important skills are not overlooked.

Navigation calibration. The other system configuration requirement is the navigation configuration. Navigation configuration is accomplished by using the top tool bar on the display screen. The middle section of this tool bar contains the Soldier's 10-digit grid location and additional information that reflects the number of satellites his system has acquired, which in turn reflects the accuracy of his location on the map. The PI described this section of the tool bar, what Soldiers should look for regarding accurate navigation from the GPS (# of satellites for accurate position location on the map; at least 5 are desired.). The Soldier's position on his own map is indicated by a unique symbol, what is called a graphic bearing indicator (GBI). This symbol is a cyan-colored "V," where the point of the "V" indicates the Soldier's direction of movement. The compass in the DRD is calibrated by clicking on the middle section of the top tool bar which links to a "calibrate compass" screen display requiring the Soldier stand toward "true north" to calibrate the system. A shortcut to help expedite a Soldier acquire satellites faster was described as well.

It is important to note that each Soldier sees himself on the map as a "V." Other Soldiers are shown as a circle with the rifle symbol inside the circle.

The navigation calibration exercise with the AIs was conducted in the context of other tasks. However, in all cases observed during the initial PE and follow-on PEs, the instructor had previously designated "true north" so this was a very easy task to complete.

Map functions. Two tool bars contain a variety of map functions (see Figure 4 for a screen shot of the display screen). The PI described and demonstrated the map functions on what was called the map tool bar and the docking tool bar. The map tool bar included zoom, pan, symbol (adding, editing, deleting, moving, annotating symbols, change size), measure function, map menu (provides list of maps available to the Soldier, allows Soldiers to change their map). Selected functions from the docking tool bar were described. This included how to center yourself on the map (your GBI), how to effectively zoom in or out by turning off the grid lines, how to turn off all Soldier symbols except yourself; how to toggle on/off the default SA settings, how to display or not display overlays sent from leaders, the types of overlays that were available (operations, enemy, fire support, obstacle, combat service support), and other map related functions. All the functions on the map and the docking tool bars were described at some point in the class.

Many of the map functions are color-coded, and these codes were described as well. For example, in order to add a symbol on an overlay, the corresponding overlay "button" on the docking tool bar must be in cyan. If the button is gray, the overlay is not functional. If the button is red, the overlay is functional but cannot be edited. It should be noted that this instruction and supporting demonstrations did not include the drawing of "tactical overlays" which is a leader function.

Only a few squad PEs could be observed because of the limited number of observers. However, for the PEs that were observed, the AIs devoted most of the time to symbols – such as adding, editing, resizing, and deleting a one-point symbol such as a checkpoint; toggling overlays on and off, and reviewing the various SA options. PEs observed for A and C Companies also indicated that Soldiers practiced storing, sending and receiving overlays. None

of the PEs that were observed involved using the measure tool. The PEs were distributed across the training (not concentrated in one block of instruction).

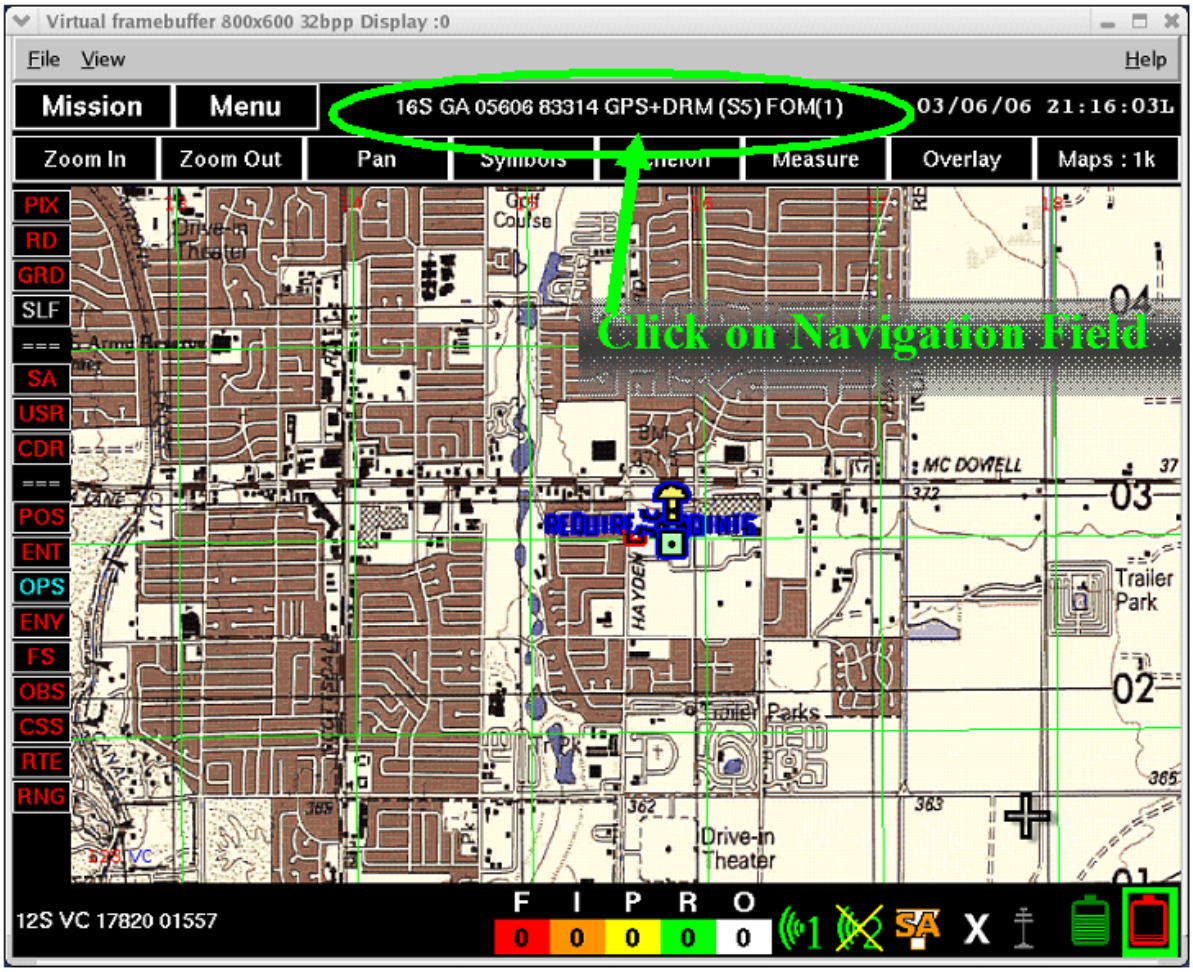


Figure 4. Screen shot of the display screen.

Digital messages. The LW system had four digital "messages": Size, activity, location, unit, time and equipment (SALUTE), Call for Fire (CFF), Call for Medic (CFM, a LW unique 911 type message), and free text (see Figure 5 for the main message menu). The e-mail functions that were common to all these messages were described and demonstrated by the PI. E-mail functions described and demonstrated included send, inbox, outbox, draft, forward (no reply function), select recipients and set default recipients, and acknowledgement.

Messages could be created via the Main Menu, but could also be created by double clicking on the map. The PI described and demonstrated this procedure. A double click on the map immediately opened up the message formats. But, more important, was the fact that the grid location that the Soldier double clicked was used to automatically fill-in the enemy grid location field in a message. Thus the intent of this procedure was to have the Soldier double click on the enemy location to enable faster sending of the SALUTE report or a CFF message.

The PI indicated that the only message linked to the lower tactical internet via the Stryker vehicle was SALUTE. He also indicated that when a SALUTE message is sent (one of the fields specifies the enemy location), that all individuals within radio range of the sender will receive an entity report on their map. These are labeled in red as an entity report and are located at the grid corresponding to the enemy location specified in the SALUTE report.

On the other hand, the CFF message will not go to the lower tactical internet. It requires approval authority. An entity report will be generated once the CFF is approved.

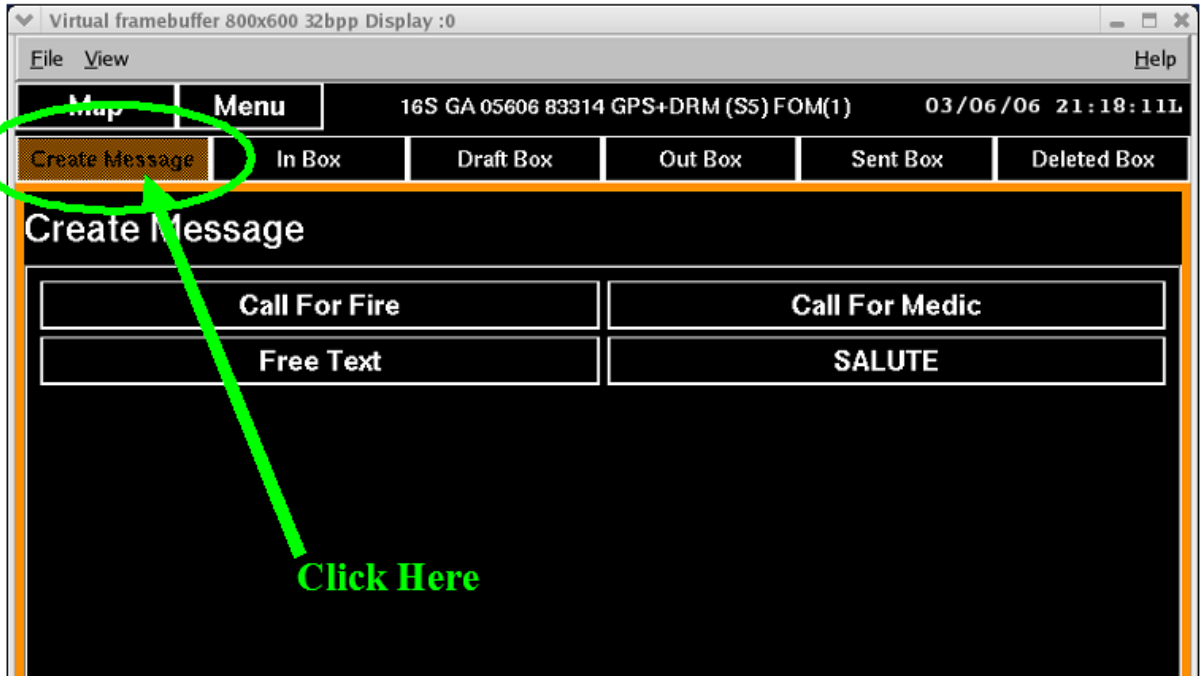


Figure 5. Screen shot of create message menu.

The CFM received special attention by the PI and AIs during classroom instruction and the PEs. The CFM instruction contained unique information as the CFM is designed to work in emergency situations. Typically a separate block of instruction as well as a separate PE was devoted to this message, since sending and cancelling a CFM is typically accomplished via a button on the SCU. None of the other messages used a specific SCU button. The PI indicated that a critical configuration setting was the default for the CFM. If a Soldier sends a CFM by holding down his SCU button for 5 seconds, the message will be automatically sent to his default recipients. In order to determine who sent the CFM, the recipient needs to open up the CFM message and then click on "view map" button. The map will then show the location of the injured individual. The different procedures for cancelling a CFM were described.

The PI also described and demonstrated other general message requirements such as specifying recipients, how to set default recipients, precedence of the message, and whether

certain fields had to be filled in. The purpose and functioning of the FIPRO icons (flash, immediate, priority, routine and out) on the bottom tool bar were explained. These icons are used to indicate the number of messages the Soldier has received according to its priority. The audible alerts associated with the flash and immediate messages were mentioned.

The PEs that were observed focused on the e-mail functions and typically used the CFM and free text messages. SALUTE was used sometimes. Practice on the CFF message was never observed, although it may have occurred in some groups. AIs tried to have everyone send at least one message. One AI reviewed the three ways of generating the SALUTE report. However, there was no requirement for each Soldier to practice each of these three techniques. It should be noted that network problems meant that many Soldiers could not generate messages simultaneously, and in some cases squad members were on different networks and could not communicate with each other. Thus the scope and pace of this training was constrained by network problems. Typically Soldiers sent messages with flash or immediate priority so they were aware of the audible alerts.

Voice communications – talk groups (Observed for S Company only). Some training on voice communications was provided in addition to the instruction on how to configure the talk groups (see above). The PI reviewed information on the proper talk groups, configuration of the talk groups, and bandwidth issues. He also explained that the Stryker will have a talk group. The PE required the Soldiers to configure their talk groups such that talk button one was for a squad member and talk button two was for the squad leader. It should be noted that it was not uncommon for other PEs during the NET for the other Companies to involve voice communications with the group.

Operation of weapon devices (WUID, DVS, TWS, STORM). The classroom instruction for operation of the weapon devices was only observed for C Company. A PE on the STORM also was observed for two Companies. The PI reviewed the operation of the WUID, such as toggling between the software interface/DVS/TWS settings, using the communications button, and using the DVS magnification button. Then, he described and demonstrated the operation of the DVS including the different fields of view (narrow, wide, zoom) and the M16 reticle and how to adjust the DVS. The order of the steps (menu selections) was the following: Configure; Sighting Device; Adjust Reticle screen; Narrow Field of View (NFOV). For the NFOV, he also discussed the aperture to refine focus and that the NFOV corresponds with zoom such that any adjustments made in the NFOV apply to the zoom mode. Finally, he explained that at 25-meter zeroing, in the wide field of view (WFOV) one click corresponds to 1 cm (rounds move 1 cm at 25 meters), and in the NFOV two clicks equals1 cm.

For the TWS, the PI explained that LW can use light, medium, and heavy versions, because they are made by the same company. He described the following light TWS functions and components: polarity (white hot/black hot); contrast knob; emergency switch; eye cup; diopter focus ring; and reticle adjustment (select reticle and adjust for windage and elevation). The TWS has its own batteries, in contrast to the DVS which is powered by the LW system. He stressed that a 10-second period of inactivity will cause the TWS to come out of the selected reticle mode. To retrieve the image, either the eyecup or the emergency button can be pressed. The emergency button allows for a constant image to the HMD; however, this setting uses a lot

of battery power. An AI demonstrated how to toggle from the DVS to the TWS image, black hot, and how to focus the optic.

For the STORM, the instruction reviewed the following topics: range compass/digital magnetic compass (determines azimuth, elevation, and bank angles to target); laser range finder (gives range to target); 12-point reset calibration (executed at 60 degrees increment); 4-point reset calibration (executed at 90 degree increments); CFF; SALUTE; and the BOI for squad leaders. An AI demonstrated the 12-point calibration and explained that the Soldier needs to separate himself from large metal objects. To perform the calibration the following steps were reviewed: menu; compass calibration; vertical and bank feedback; six points at an upward angle; six points at a downward angle; and within 10 degrees. If the accuracy is 0.9 or greater, then calibration should be repeated. Finally, the PI explained that the warnings in operator's manual and the 25-meter zero offset.

Weapon PE for S Company. For this Company, portions of the PE for operating the various weapon devices were observed for several groups. There were only six STORMs available for training, so these were rotated among the squads throughout a couple of the training days. Additionally, since the TWS is a piece of leader equipment, it was rotated among the squad members so that all Soldiers were familiarized with it.

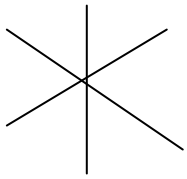
The first group observed performed the following activities for the WUID: reviewed cables from weapon system to HMD to body system; toggled between the TWS, DVS, and HMD; toggled between the different DVS fields of view (WFOV, NFOV, Zoom); and practiced using the push to talk button and the STORM controls (2 buttons on top: STORM – lazing and ranging; lights). This group performed the following activities for the DVS: viewed through the NFOV and zoom; looked at the reticle pattern; changed the reticle settings for the DVS (black, white, reverse) using the configuration menu for the DVS. (The reverse setting changes the reticle to white or black when the background changes to provide a good contrast.) All Soldiers in the group selected the reverse setting. They adjusted the reticle by moving the reticle to the right and down (5 increments in each direction). For the TWS, this group practiced turning it on, activating the image with the eyecup, and changing the reticle to correspond to different weapons – M136, M16, none – white hot, black hot. The AI also reviewed that while in the emergency mode, the TWS is on all the time and therefore uses battery power quickly. He also explained that the Soldiers zero the sight using the controls on the actual TWS, but that the data transfers to computer and to the HMD.

The second group observed practiced calibrating the STORM (six points upward; six points downward). The AI explained that it is necessary to recalibrate if the environment changes such as changes in metallic objects and temperature. He also stressed that the calibration needs to be 0.9 or lower. Finally, he said that scouts could ID targets (laze it) and send a SALUTE report and populate the map.

The third group observed passed around the TWS. The instructor quizzed the group on the functions already covered.

For the fourth group observed, the instructor explained that the STORM should be recalibrated if you move 20 meters or if the temperature changes to fine tune the magnetic compass. He asked the Soldiers to lase the 2nd story building and obtain the distance and compass grid. He explained that the azimuth is only as good as the 12-point calibration performed (must be away from metal). Finally, he reviewed the different modes of the STORM.

Weapon PE for R Company. The PE on the STORM 12-point calibration was observed for two groups from R Company. The trainers marked lines on the ground for the 6 different angles in which he must stand. These lines form a "star" as shown below. This made it easy for each individual to get the correct azimuth during calibration. The leader must rotate around this "star" twice, yielding 12 points. The leader is cued in the HMD to put the weapon up during the first rotation and was provided feedback when the weapon angle was appropriate and when he could input that setting. Similar cues were provided on the second rotation when the weapon was pointing down. Final reading on the STORM indicates whether the calibration has been successful.



The Soldiers calibrated the STORM, even though only squad leaders will have this equipment item. The calibration readings for eight of the Soldiers were recorded; time to calibrate for three of these Soldiers also were recorded. Satisfactory readings are 0.9 or less. Two of the eight Soldiers successfully calibrated the STORM (see Table 7 below). The next day a squad leader was observed to successfully calibrate the STORM three times.

Table 7
STORM Calibration Results During PEs

STORM Reading	Time to Calibrate	Successful Calibration
Initial PE - Soldiers		
2 plus	NA	No
1.2	NA	No
0.9	NA	Yes
0.7	3 min 15 sec	Yes
5.8	NA	No
4.9	NA	No
3.1	9 min	No
6.8	4 min	No
Subsequent PE – Squad Leader		
0.3	NA	Yes
0.5	NA	Yes
0.9	NA	Yes

During one PE, the platoon leader used the STORM to get the distance to an object. He initially had trouble getting a reading because he was lasing the sloped roof of a building and the laser was bounding off it. He got a reading when he lased the wall itself.

Observer comments. Data from the STORM calibration PE indicates that practice is needed to successfully complete this task. In addition, the training could be enhanced by including specific exercises on lasing to pre-determined targets and under different conditions to ensure that individuals know what is required to have an accurate measurement with the STORM.

Field functionality test (FFT). The PI explained that the step-by-step procedure of the FFT is in the Quick Reference Card (QRC); Soldiers can use the card as a memory jogger. The PI also emphasized to always check the cables. The S Company groups then performed the FFT step-by-step. One group observed in R Company performed the FTT, and the AI had them execute the system test as well. The system test was beneficial, as problems were found with some systems.

Image editor. The PI presented little information on this capability as it was not fully functional. Information was provided on how to load and save images, how to add a shapes and symbols to the images, and how to edit and delete these shapes (basic graphics shown). No picture will leave the LW system. Three pictures were loaded on the systems of the MOUT site at Ft. Lewis.

The PE for one group from S Company was observed. The Soldiers practiced drawing on the preloaded images. The AI also explained that the pictures can be saved by overwriting or renaming them and can be attached to an e-mail. There was no PE on the image editor for R Company, only instruction.

Creating and applying missions. The PI indicated they were not teaching the orders process, but rather the management of orders and related overlays on the system. The PI demonstrated how to create a five-paragraph operations order (OPORD). He also explained that the overlays have to be attached to the active mission. He stressed that only one mission can be active at any point in time. Consequently, it is necessary to deactivate the old mission and make the new mission active. He warned that when the draft is saved it overwrites the current draft.

He also demonstrated how to issue and receive orders with attached overlays. In order to view the orders and overlays, the receiver clicks on the flash message in his inbox and then must apply the received order by setting the mission active and applying the orders. The receiver must then click on the message in his inbox for the overlay and apply it (the mission must be set as active). Then, the Soldier can toggle the overlays on and off. The receiver also can edit and save the edited orders. The receiver also can forward (reroute) the order.

For R Company, creating and sending OPORDs and overlays consisted of a brief review of how to create a mission. This was followed by a demonstration of how to put a couple of symbols on the map to create an overlay, putting some text in the five paragraphs, sending the

order and overlays to another squad member. Lastly, the PI indicated how to open the order and the overlay message and apply the overlay to the map.

Mission management PEs for S Company. Portions of the PE for applying missions and overlays were observed for two groups from this Company. For the first group observed, the Soldiers created an OPORD, and the AI instructed them to only become familiar with the information. The Soldiers sent fragmentary orders (FRAGOs) but only some people received them.

For the second group observed, the AI explained that the point was to understand the basic functionality of mission management. He instructed the Soldiers to create a mission (i.e., create an OPORD), fill in something in each box, attach a single symbol, and send it to their buddy as a flash so the buddy would receive an audio and visual alert. The instructor then explained that the buddy who received the order and overlay should see two messages in the inbox (the mission and the overlay). The AI instructed the receiver to open, apply, and store the overlay. Then, he instructed the receiver to create a response back to the buddy who sent the order by putting an obstacle next to the symbol. The AI stressed that the first mission must be deactivated and the one that is currently being created must be active. The AI repeated the following instructions several times: create OPORD/mission and make active; go to map and create overlay (add a symbol); store; go back to order; and issue order (attach overlay). The AI also repeated the following information for the recipient: open mission first then open overlay (turn on overlay – toolbar on left); select echelon and store; and create new mission (make sure that the overlay that was just received is active).

Mission management PEs for R Company. Portions of the PE for applying missions and overlays were observed for three groups from this Company. The AI walked the Soldiers through the following process of creating a warning order (WARNO): Mission # - make it your row and your seat (04-09); Mission Name – your first name; make mission active; and go to orders box. Then, the Soldiers were instructed to create an overlay and link it to the mission. Finally, they were instructed to send the mission and overlay by using the following steps: go to mission and open order, issue order, attach relevant overlays (overlays you created are listed here and select the ones you want to attach to your order), and send to buddy. Due to network problems, everyone was not systematically receiving orders. Instructor did not check each person – with any technique.

The second group was observed checking active and inactive missions. The third group had communication problems; the squad members could not send messages to each other (there were three networks within the squad). It was difficult to conduct the PE; the Soldiers had to shut down and start up again.

> *Observer comments*. The block of training on mission management was a general overview of the major steps involved. In reality, most Soldiers would only have to ensure one mission is active and then open/activate the order and overlays sent to them. They would not need to create a mission, an order, and an overlay. So some of the steps practiced would probably not be executed by most Soldiers. The observations also

indicated that the mission management procedures were not user-friendly or intuitive, as they had to be repeated several times for Soldiers to remember them.

On the other hand, leaders did not receive instruction and practice on how to manage mission information and how to use the planning tools within the LW system. For example, there was no discussion of how to make the order paragraphs concise, tailored for easy comprehension on a HMD display. There was no discussion of how to manipulate/show the various overlays available (operations [OPS], enemy [ENY], fire support [FS], combat service support [CSS], obstacle [OBS]) – what combinations would be most beneficial to lower-echelons. There was no opportunity to practice plotting multi-point symbols and become proficient with the annotation/labeling processes. Similarly, there was no opportunity for leaders at higher echelons to interact with leaders at lower echelons to determine how they could best apply these LW capabilities. A longer-time for NET and/or a phase of NET that was tailored to leaders is probably needed to address these training issues.

Purging the system and loading the MDP. The MDP contains images, maps, overlays, unit task organization (UTO), etc. The PI explained that the MDP is imported from a notebook computer. A universal serial bus (USB) memory stick that adapts to the LW connector is used to install the MDP on the Soldier system. The MDP management is under the main menu – Install MDP. Attach the USB adaptor to the radio and then attach memory stick to install. The AI explained that the system has to be restarted with a new MDP. The PI demonstrated how to initiate and stop the purging process and how to load the MDP from a purged system. Soldiers have 30 seconds – to type password and hit "stop purge."

The PEs consisted of having all of the Soldiers purge their systems and load a new MDP. Soldiers were instructed not to purge until they had a memory stick and adaptor. One AI explained that process takes about four to seven minutes per person. The purging and loading of the new MDP required between two and three hours in part because the process takes between four and seven minutes per person and because there were a limited number of memory sticks. For one company, only six memory sticks were available for the entire class.

While Soldiers waited for the USB stick, AIs typically reviewed the tasks that were on the performance evaluation or worked on system problems with individual Soldiers.

Performance Testing

For the first iteration of the NET, the Soldiers were divided into three groups and were rotated through the evaluation, a maintenance support class, and a troubleshooting class. Prior to the evaluation, the entire company powered up and performed a FFT using the QRC. For the evaluation, there were 18 testing stations. At first, each evaluator tested one Soldier at a time, but the PI determined that this format took too much time. He decided to pair up the Soldiers so that one evaluator rated two Soldiers at one time. The performance testing for the second iteration of NET was not observed.

For the final NET iteration, the PI followed the revised procedure used with the first iteration. The entire company was spit such that 78 of the Soldiers were tested first while the other 20 Soldiers attended a LW support equipment class. There were 20 test stations for this iteration. The Soldiers were divided into 18 groups of four and two groups of three, and were assigned a testing station. The Soldiers were tested in pairs, so one pair waited for the other pair to complete the evaluation. Prior to the start of the evaluation, the evaluators disassembled the Soldiers' systems around the perimeter of the building that was sectioned off from the rest of the classroom. The pair of Soldiers was then evaluated on tasks associated with assembling the LW system (Task 1 parts a – d; see Annex B). The Soldiers were then taken outside of the building and evaluated on tasks associated with operating the LW and weapon subsystem and using the LW system to perform voice communications, send digital messages, call for medic, and navigate (see Annex B for a complete list of tasks).

An area of the building was designated to retrain those Soldiers who received a No Go on a critical task. For non-critical tasks, the Soldiers received immediate feedback and were retested. All Soldiers were retrained until they received a Go. Overall, only one Soldier did not pass the evaluation because he refused to take the test. One pair of Soldiers from C Company was observed. They completed the evaluation in 45 minutes (17 minutes for assembling the system and 28 minutes for the remainder of the tasks). It was observed that a pair of Marines completed the test much earlier than the rest of the Soldiers that began the test at the same time; they said that they finished the test in 10 minutes because they were competing against each other. The total time for the entire company to complete the performance evaluation was 5 hours and 23 minutes. [In the Master Training Course conducted in December 2005, the average time per individual to complete the performance test was 75 minutes using a one-on-one procedure. The scope of the test was similar to that in NET.]

The performance test consisted of 9 tasks for a total of 45 steps or procedures (see Annex B). The percentage of individuals who completed all test items the first time without errors for each of the companies was 96%; 88%, and 92%. For the 5-day NET it was, 83%. The number of Soldiers who received a first-time No Go on any task step is presented in Table 8. Only tasks and task steps for which errors occurred are presented.

Table 8
NET Performance Evaluation Results: First-Time No Gos

	T Co (*94 tested)*	**R Co** (*101 tested)*	**S Co** (*98 tested)*	**Follow-On NET** (*30 tested)*
Assemble the LW System				
• Install Daylight Video Sight (DVS) in the correct rail position	1		1	1
• Install Weapons User Input Device (WUID)	1			
Operate the Land Warrior System				
• Configure Call for Medic Recipient	3	1		1
• Place coordination point symbol on map at a given coordinate (1)	1		3	3

• Displace coordination point to: 10T ET 29000 19000	2	3		
• Display all friendly SA	3		1	1
• Locate Graphic Bearing Indicator	3			
• Place coordination point symbol on map at a given coordinate (2)	2		2	
• Filter friendly SA	2		2	
• Measure distance between coordination points	1	1	1	
• Log on to the LW System			1	
• Enable audio and visual alerts				1
• Configure correct talk group		1		
• Mute talk button 1	1			
Operate the Weapon Subsystem				
• Change Reticle Type / NFOV to Reverse	1			
Call/Cancel Call for Medic (CFM)				
• (Activate) Send CFM. Press the push–to-talk (PTT) button on the SCU for 5 seconds	1		1	
Send Digital Messages Using the LW System				
• Create Free Text message				1
Navigate				
• Calibrate Compass				1
Total Errors for Each NET	22	6	12	9

Observer comments. The number of Soldiers who received a No Go was low. There are several possible reasons for this. Some of the tasks were relatively common and therefore repeated during the PEs or required few steps (e.g., log-on, calibrate compass, configure talk groups, enable alerts). Another factor was that the AIs reviewed the basic procedures the day prior to the test. A consideration for future NETs is to conduct the test later in the NET and to incorporate some more complicated tasks and tasks that are put within a mission context.

It is suggested that the performance test in future NETs be expanded and tailored to duty positions. Because the current NET did not include a specific track or block of instruction for leaders, the performance test did not assess leader-specific skills. For example, the leaders were not tested on their ability to calibrate the STORM nor on using the order and overlay functions in a tactical context. Test items for medics could include a section on the CFM. Similarly, Field Artillery personnel could have items devoted to CFM and the FS overlay.

Familiarization with the LW Support Equipment

Only one Company was observed. Soldiers rotated through the LW support equipment class either before or after they participated in the performance evaluation. First, all Soldiers attended a class (approximately 1 hour and 25 minutes) that covered the components and capabilities of the VIK, Commander's Digital Assistant (CDA), MDSE, and battery chargers.

Then, the Soldiers were divided into two groups and rotated through a 25-minute PE on the CDA and a 25-minute class on the MDSE hardware and software.

Observer comments. Two factors limited the usefulness of this training. First, no VIKs were available, so the Soldiers were unable to become familiar with the actual equipment. Second, the CDA and MDSE will only be used by leaders. Other types of concurrent training may have been more beneficial for Soldiers during this period. For example, the unit could have boresighted their weapons during this time to reduce range time or instruction could have been provided on reduced exposure firing techniques.

Maintenance and Troubleshooting Procedures

Only one Company was observed. The instructor reviewed the basic maintenance concepts (inspect system every day, check BIT screen for failures, etc.), operator-level maintenance, and preventive maintenance. The Soldiers were instructed to contact contractor logistics support (CLS) to remove faulty equipment. The instructor also reviewed how to conduct Preventive Maintenance Checks and Services (PMCS). The Soldiers then completed Department of the Army (DA) Form 2404 and conducted a PE on troubleshooting using the QRC.

Additional observer comments about Week 1. There were training distractors during the first week of NET. Throughout all three iterations of the NET, there were some problems with the network configuration and system communications. These were in part due to GPS keys being dropped, bandwidth restrictions, and a defragmented network due to the different enhanced position location reporting system (EPLRS) networks operating at Ft. Lewis (Soldiers in the same talk group powering up on different networks). When the network was down (e.g., demonstrators could not send messages to each other), the PI adjusted the training and covered a different aspect of operating the LW system that did not require use of the network (e.g., the weapon subsystem). In this way the Soldiers continued to learn about the LW system and were not waiting on the network issues to be resolved.

To try to resolve the defragmented network issues, the Soldiers were instructed to power off their systems after each exercise so that they might all come up on the same network when they powered on again. To address some of the bandwidth issues, the radio was restricted to 15 people per talk group. Additionally, a squad could only talk to one other squad (e.g., 1st and 2nd squad could talk but 1st squad could not talk to 3rd squad), and members of a squad could only have access to talk group #1 (i.e., they could to talk to higher echelons). Further, the filter friendly SA was configured so that each rifleman sees two up and one down.

Given the importance of the network to LW operation, a consideration for future NET is to include specific training and instruction on the structure of the network and how it functions. This training should only be given, however, to the leader and technical personnel with the unit.

Different rates of skill acquisition became apparent during the PEs. This was not unexpected, given the large class size and diversity military experience and duty positions with the class. AIs used different techniques to adapt to this situation. For some the PE was consumed by training on the desired skill set. For others, when the group completed the desired training, some AIs went on to another topic while others released the squad/group. Others would continue to review and go into greater depth until asked by the PI to finish.

Some suggestions to enhance the training of the software interface include: putting the tasks within the context of a military operation, providing an overview of how the interface is organized or structured, and providing more information on dropdown messages (e.g., symbols, message selections) or incorporating such training in the PEs). In addition, the introduction to the system could clarify how the computer, network and GPS are integrated to provide the unique LW capabilities and features.

Week 2: Summary of Training Observations

Only one Company was observed. Informal feedback was obtained on the field training in the other NET iterations.

Marksmanship

The LW system incorporates a new optic, called the DVS, on the M4 carbine and the Squad Automatic Weapon (SAW). The DVS is linked via a cable to the LW computer and the HMD, which allows the Soldier to observe and engage targets from a reduced exposure position. If a Soldier has a TWS, the image from the TWS can be viewed with the HMD via a cable link, as well as used in the traditional direct view mode.

Boresighting. Each company boresighted the DVS and TWS in one day. The total training time for this event was double what was planned (approximately 3.5 versus 2 hours). Only 16 boresight kits (14 from the NET instructors; 2 from the unit) were available for this training which contributed to the additional time needed to complete this task. However, only 13 lanes were used to boresight; the first platoon utilized the first seven lanes and the second platoon used six additional lanes. The third platoon lined up behind these platoons and rotated in as the Soldiers finished. One lane was added later in the training. The SAW Gunners and Soldiers with the M203s were instructed to group together on lanes. Nine instructors were available to help those Soldiers who needed assistance.

The PI demonstrated how to boresight the DVS. He instructed them to boresight in both the wide and narrow fields of view (FOVs). He also stressed that when boresighting, the reticle is adjusted in the opposite direction (e.g., to move up; adjust down). They also were instructed to not use the creeping method for boresighting that they may have been using with their unit. Only the first platoon received the brief instruction. The second platoon was instructed to power up, perform the FFT, observe the first group boresighting and rotate in as the first group finished. One AI was observed providing information to a Soldier regarding the concept of boresighting and walking him through the steps.

Observations of Soldiers working with the AIs indicated that these Soldiers boresighted in both FOVs and were instructed how to save their adjustments. One AI instructed Soldiers at the target to point to the bottom "star" so that the Soldiers boresighting in the WFOV could put the reticle on center mass (some Soldiers had a difficult time finding the star in the WFOV). This AI also informed some of the Soldiers that at 300 meters it is off 1 inch.

The following boresighting times were recorded:

- M203 firer without AI assistance boresighted the DVS in 18 minutes (cannot confirm that the Soldier boresighted in both FOVs).
- M203 firer with AI assistance boresighted in the DVS in the WFOV in 23 minutes and then in the NFOV in an additional 6 minutes (total time = 29 minutes).
- M4 firer without AI assistance boresighted the DVS in 6 minutes (cannot confirm that the Soldier boresighted in both FOVs).

- M4 firer with AI assistance boresighted the DVS first in the NFOV in three minutes, second in the WFOV in four minutes, and third with the TWS in four minutes (total time = 11 minutes).

The first platoon finished boresighting in 93 minutes (cannot confirm if all Soldiers in this platoon had finished).

Observer comments. The purpose of the overview seemed to be on explaining what was different when boresighting the DVS and not on providing detailed instruction on actually how to boresight. The NET should not always assume that Soldiers have been trained on this previously.

It was difficult to tell whether Soldiers who were working only with other Soldiers boresighted in both FOVs and whether they saved their adjustments. A more systematic check of Soldiers should be made to see if they remember to boresight in both FOVs and whether they know to save their adjustments so that they will have a greater probability of hit during the familiarization fire.

Zeroing. The company zeroed on the same day that they boresighted. When the first platoon finished boresighting, they zeroed using 11 points on the other end of the same range. This platoon received a brief instruction on how to zero. The instructor explained that it is different than boresighting – the direction you need to move the bullet is the direction that you click. The Soldiers were instructed to zero first in the wide FOV and then in the narrow FOV. They were told that the first three rounds were not for zeroing – they were used to make sure that the DVS was locked on the rail. The second three rounds were for the first shot group, and the third three rounds were to confirm the shot group. Each Soldier was given a 30-round magazine. Soldiers fired from the foxhole supported position. There were two instructors present to assist the first group of firers for the first 30 minutes, and then a third also was available. The company also was instructed to zero the TWS in both the wide and narrow FOVs.

The planned time for zeroing as indicated in the POI was 2 hours and 55 minutes. The entire company zeroed in approximately five hours and 35 minutes. The first Soldiers to zero took approximately one hour.

At the end of the day, the Soldiers received a 10-minute class on reduced exposure firing after they finished zeroing. The instructor demonstrated how to fire from a building with a T intersection, how to fire left-handed (if a right-handed firer), and overhead. After the demonstration, the instructor asked the Soldiers to practice; however, only a few did for a very short period of time.

Observer comments. The following issues may have contributed to Soldiers taking longer to zero than planned. C Company was a newly formed unit consisting of many inexperienced firers, and limited feedback was provided to the firers regarding marksmanship fundamentals, using the DVS, etc. Some Soldiers were not familiar with the boresight kit, and some were observed firing from unstable positions. As found in prior LW training assessments/observations (Dyer, 2004; Dyer et al, 2000) lack of

prerequisite skills is a training distractor, as trainers must take the time to make up such deficiencies/weaknesses. Such time must be built-into the NET POI. Moreover, the Soldiers could not fire from the prone position because the grass on the range was too high and blocked their view of the targets. Also, some Soldiers reported that the DVS image was not clear. The PI confirmed that this has been a problem and relayed the feedback to the engineers. Finally, some wrong targets were put up (i.e., M4s firing on M203 targets) so there was a short delay in training as all of the targets were checked. If the wrong targets were up for an extended period, then this would have contributed to the additional time the Soldiers needed to zero.

However, the fact that boresighting and zeroing took an entire day for a company of Soldiers was not unexpected, given historical data. Boresighting and zeroing times depend primarily on three factors: Soldier expertise, number of lanes for boresighting and zeroing, and number of systems or FOVs to boresight and zero. Everyone had to boresight and zero two FOVs with the DVS. Some Soldiers had to also boresight and zero the TWS. Using the times obtained during the NET and during the LW Master Trainer Course (Dyer, 2006), estimates were made of the total time for 80 Soldiers to boresight and zero the DVS, given variations in time to boresight/zero and the number of lanes available. These results are shown in Table 9.

The results show that the planned POI times (2 hours for boresighting and 3 hours for zeroing) assumed that Soldiers would boresight and zero quickly (refer to columns 2-4 in Table 9). The actual times corresponded more closely to a doubling of the times for each Soldier. The cells that correspond most closely to the actual times and estimated number of firing/boresighting lanes are highlighted in gray in Table 9. Cumulatively, these times account for a day of training.

Table 9
Estimated Times to Boresight and Zero the DVS (2 FOV) for 80 Soldiers

	15 Minutes to Boresight			**30 Minutes to Boresight**		
Time for 80 Soldiers	10 lanes / 8 FO	15 lanes / 6 FO	20 Lanes / 4 FO	10 lanes / 8 FO	15 lanes / 6 FO	20 Lanes / 4 FO
Minutes	120	90	60	240	180	120
Hours	2	1.5	1	4	3	2
	30 Minutes to Zero			**60 Minutes to Zero**		
Minutes	240	180	120	480	360	240
Hours	4	3	2	8	6	4
Total Hours	6	4.5	3	12	9	6

Note. Times to zero incorporate walking down range to the zero target, plus the time to determine adjustments and check all the Soldiers' targets. "FO" stands for "firing order."

Familiarization fire. The Soldiers were introduced to the range and the type of targets (pop up targets at 75, 175, and 300 meters). The SAW gunners had some targets that were farther out than 300 meters. For reduced exposure firing, the Soldiers were instructed to use the DVS (not revert to optics), shoot on the right side for safety reasons (the hot brass will hit them if they fire from the left side), fire in the narrow FOV because it is clearer, and *not* fire with the TWS. The instructor also stressed the fundamentals (sight alignment, trigger squeeze, etc.) and explained that they could use sandbags to support their elbows when performing reduced exposure firing from the unsupported foxhole position.

The company was split so that two platoons conducted the land navigation event and one platoon conducted the familiarization fire. The training for a single platoon was observed. Although the range had 35 firing points, the platoon only used 17 points. There were seven lane safety personnel and four instructors. Initially, Soldiers fired 40 rounds (one 30-round magazine and reloaded) with all targets up. Then, the M4 (M203) firers conducted their tables followed by the SAW gunners. The firers did not receive feedback from the range tower regarding their hits and misses. Some Soldiers who were having trouble hitting the targets received coaching by their unit members who were walking the firing line. Informal interviews with a couple of Soldiers indicated that they acquired and engaged the targets only with the DVS (they did not try to acquire them with direct view).

After the Soldiers completed their tables, they were instructed to fire from behind barricades that were set up in front of the foxholes of the lanes that were not being used to fire the tables. Eleven barricades were used (see pictures in Figures 6 and 7 below). Few Soldiers practiced firing from each different type of barricade and none received feedback regarding stable firing positions or number of hits.

Table 10 below summarizes the DVS firing tables. TWS tables typically replicated the DVS tables. As indicated in the tables, Soldiers were to fire from both indirect view and reduced exposure positions. Indirect view refers to firing by using the image projected to the HMD to acquire and engage targets. This was possible with both the DVS and TWS. Firing positions are the same as with traditional direct view firing. Six of the seven firing tables involved indirect view firing. Reduced exposure firing also uses the image projected to the HMD, but the firer positions himself so he minimizes his exposure to the enemy. This requires Soldiers to learn new firing positions because the weapon must be stabilized differently. One firing table involved reduced exposure firing. Observations of the M4 firers indicated that all of the tables were fired except the kneeling sling.

Table 10
Summary of Familiarization Firing Tables for the DVS

Weapon – Table # - Firing Position	**# Rounds**	**Target Distance (meters)**	**Exposure times (sec)**
M4 - #1 Indirect View, Foxhole supported	20	75, 175, 300	9, 12, 15
M4 - #2 Indirect View, Foxhole unsupported	20	75, 175, 300	9, 12, 15
M4 - #3 Indirect View Prone supported	20	75, 175, 300 some double exposure	9, 12, 15, 20
M4 - #4 Indirect View Prone Unsupported	20	75, 175, 300 some double exposure	9, 12, 15, 20
M4 - #5 Indirect View Kneeling Sling Supported	20	75, 175 some double exposure	9, 20
M4 - #6 Indirect View Standing Sling Supported	20	75, 175, some double exposure	9, 20
M4 - #7 Reduced Exposure Foxhole	20	75, 175, some double exposure	9, 20
Total # Rounds	150		

Observer comments. Although the POI allocated seven hours and 55 minutes for the familiarization fire, the platoon only took approximately three hours to complete this event. Additional time could have been used to coach and mentor the Soldiers when firing from a reduced exposure position, e.g., how to establish a stable position when firing behind each type of barricade, how to switch FOV quickly and still maintain weapon stability and their sight picture.

For both indirect view and reduced exposure firing, Soldiers should have been provided with the number of hits at each target distance, so they could make adjustments to their shooting techniques. The range used for this period of training had automated scoring capability, which could have been used to provide feedback on hits and misses by firing lane and by distance to target.

Prior research on reduced exposure firing techniques (Dyer et al, 2005) has shown that the following skills must be trained in order for Soldiers to be proficient with reduced exposure firing techniques.

<u>Firing position</u>:
- Firer must assume a position that provides adequate cover and concealment.
- The firer must be stable – stability of weapon and firer are critical.
- Cover and concealment must not obstruct the view of the optical device.
- Firer must consider presence of hot brass ejected in close-proximity to exposed skin.

<u>Weapon stabilization.</u>
- Weapon butt stock must be stabilized.
- Front of the weapon must be stabilized.
- Weapon must be able to move to allow scanning.

- Trigger control must be maintained to prevent loss of a stable sight picture during firing.

These points were not systematically presented to the Soldiers nor were the Soldiers coached to ensure that they had acquired these skills.

The pictures below illustrate reduced exposure firing positions used by Soldiers during the Familiarization Firing period of training.

Figure 6. Indirect view firing position, foxhole.

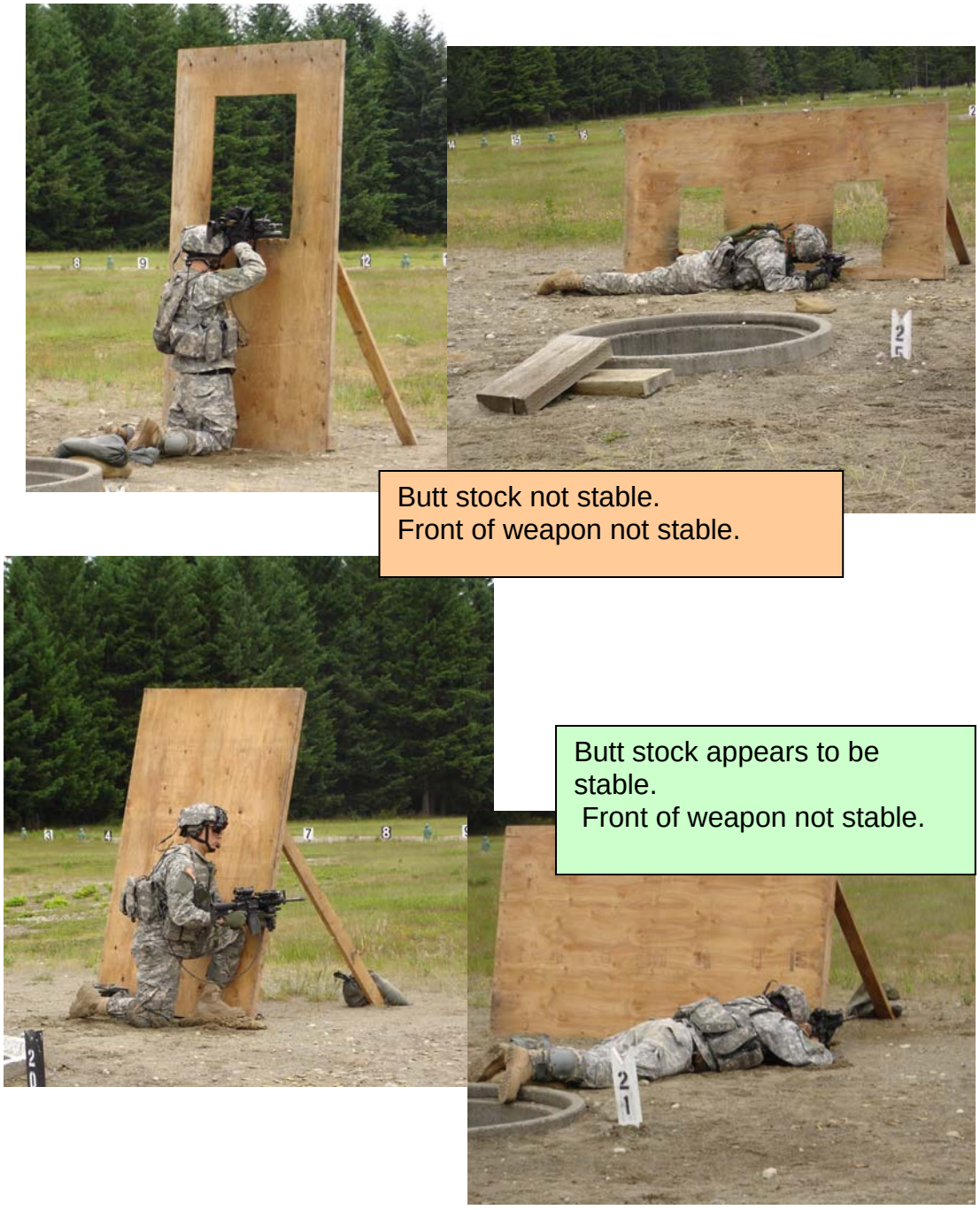


Figure 7. Reduced exposure position firing.

In addition, there was no practice on techniques of scanning and switching from one FOV to another. In part, the narrow firing sectors on the range that was used inhibited this type of training. But scanning techniques should be trained in future NET.

Individual Land Navigation

The Soldiers were introduced to the day land navigation course. The standard was to find four out of four points in two hours. The course was 1200 meters long (a large field). Soldiers were instructed to zoom in on the point markers because the markers could be as close as 20 meters apart and then zoom out when walking. They were instructed to use the QRC to troubleshoot. One platoon was observed, and the Soldiers plotted their four points in five-man groups. They were instructed to add symbols to the map as four checkpoints and then to add the grid points. The instructors then checked their points and reminded them to calibrate their compass. As the Soldiers returned from the course, they were graded according to how many correct points they found and received either a Go or No Go for the training event.

> *Observer comments.* The value of this exercise may have been reduced for Soldiers who felt that the location of their GBI did not update quickly. One Soldier, who was observed performing the course, indicated that he walked faster than the location of the GBI could update. He said that it appeared that the GBI stayed with him but then when it updated he was past his point. Despite these system problems, he said that a lot of time is saved with the LW system because usually he has to stop and shoot an azimuth every 10 meters.
>
> Day land navigation exercises provide Soldiers basic experience in plotting points and help them gain confidence in using the system's GPS. Executing a land navigation course at night increases the complexity of this task as Soldiers must also learn how to employ their night vision goggles along with the HMD that shows their route, maintain light discipline and their night vision, and how to avoid becoming completely dependent on the route display. There is some transfer in skill from day to night land navigation, but additional skills must be acquired. It is recommended that future NET include night land navigation training and evaluation as well.

Formations and Orders of Movement

For this collective training event, the Platoon Sergeant (PSG) sent an overlay to the squad leaders prior to the start of the training. Then, the instructor reviewed the advantages of performing the basic infantry formations and orders of movement with the LW system. Specifically, the LW can be used to perform a modified wedge such that buddy teams are spread 75 to 100 meters apart. This enables the squad to have more security, more fire power, and communication necessary to move a buddy team. The squad leader may not be able to visually see the buddy team due to the terrain but he can see them on the map. Also, the squad file is usually performed in thick terrain; however, with the LW system you don't have to do this. For movement at night, the squad doesn't have to stop to check the compass, find Soldiers, etc. For platoon movement techniques, the Platoon V (looks like an inverted Y) with two lead squads to suppress enemy and headquarters placed in the middle and a squad in the rear. For the platoon column, the distance could be 400 meters and could cover 1 km. Traveling overwatch becomes more like a travel technique; for bounding overwatch, the bounds can be increased because the location of everyone is always known.

One squad was observed, and the squad leader said that the PSG gave him an overlay with two phase lines. The squad moved with bounding overwatch first then moved by traveling overwatch when it reached the second phase line. The training area included and was adjacent to the land navigation site (a large field). Several Soldiers indicated that their GBIs did not update quickly enough. The instructor said that when the "SLF" button (centers map to the individual's location or GBI when enabled) on the docking tool bar is turned on that it might take the system longer to update because it has to update the entire map. He suggested turning off the "SLF" button when moving as a squad and only update it occasionally (when it goes off of the map). Also, some Soldiers saw squad members in different places on their maps and did not have many satellites. The instructor told them that they could punch in the 10-digit grid coordinate of someone who had more satellites to acquire more.

Observer comments. This was the first collective field exercise using the LW system. At this point, Soldiers started reacting to how they would use the system and the nature of the information the system provides. In the after action review (AAR), some Soldiers expressed concern over spreading out too far. They explained that if there was contact it would be really hard to fight back from that position; it was unrealistic to spread out so far. The instructor replied that the PSG took it to the extreme to see how the communication was working and that the platoon does not have to spread that far out – probably just more than normal.

In addition, the Soldiers wanted the other Soldier icons to show the direction of movement of others in their squad/unit. (Note. The icons for the other Soldiers are a circle with the symbol for a rifle in the center, which looks like an arrow. The Soldiers apparently thought this symbol could be used for indicating the direction of movement of others, not just represent an arrow that always pointed to the top of the map (north)). The training points here are explaining to the Soldiers what the icon represents, and also the difficulty in displaying the direction of movement of all others in the unit.

One Soldier said that the FO couldn't talk to the squad. The instructor replied that the radio is restricted to prevent overpowering the network (15 people per talk group) but that the squad could program the SAM card to talk to the FO.

Employ LW System (plan, prepare, & execute a mission)

The company-level exercise was conducted at the Ft. Lewis urban operations site. Opposing force personnel were placed in several of the buildings, and several squads dismounted the Stryker vehicles and provided support by fire. Several other squads cleared another group of buildings, and then moved to the compound that was being fired on by the other squads. Then, two Stryker vehicles dropped off the squads near the perimeter of the compound, and these squads cleared the buildings in the compound. The squads continued to clear the junkyard next to the compound. They did not use the LW system to communicate, but shouted at each other instead. They cleared the last building and pulled security around the area. The company took approximately three hours to complete the mission. However, the POI allocated six hours to train this learning objective.

Observer comments. The company-level exercise was conducted by the unit. However, because the leaders had not been trained on the MDSE prior to NET, key personnel from the NETT had to work with the unit leadership to input the order and overlays for the mission.

Prior experience with the LW system has shown that squad and platoon-level exercises that stress employment of the LW capabilities should precede company exercises. Unless such structured exercises are incorporated in the training plan, individuals do not change their habits and tend to function as they have previously. Use of such LW features as the radio, graphics/overlays to control movement, digital transmission of information, new optics to detect and acquire targets, etc. does not occur automatically on the part of individuals, leaders, or units. Several shorter collective day and night exercises could have been conducted that highlighted the advantages of using the LW system. Each exercise could have focused on different sets of LW skills critical to successful unit performance. It was the Battalion's responsibility to develop TTP for using the system. However, a NET that included well-crafted exercises that forced employment of LW capabilities would provide the necessary learning ground for the development of effective TTP.

After Action Review (AAR)

The AAR conducted on the final training day was not an AAR that addressed the company-level field training exercise. Instead, Soldiers completed comment sheets produced by the training organization on the LW system.

Follow-On Five-Day NET: Summary of Training Observations

Thirty Soldiers from the three companies who were unable to attend the nine-day NET participated in the first follow-on five-day NET scheduled from 10 – 14 July 2006. One observer made complete formal observations of this follow-on NET.

Scope of the Training

The first three days consisted of classroom training and covered many of the topics that also were presented in the classroom training portion of the nine-day NET. The classroom training occurred in a room just large enough to accommodate the 30 Soldiers. A projector and breakout box were used as described for the nine-day NET. Soldiers received copies of the Operator's Guide and QRC. The fourth day consisted of the performance evaluation and a short land navigation course. The fifth and final day of the NET consisted of field training for marksmanship (boresighting and zeroing). Table 11 summarizes the training times.

For the classroom training, the Soldiers were instructed to sit at tables with other Soldiers in their company. There were a total of eight tables and nine instructors. However, during the PEs, the Soldiers formed six groups, and the group with the largest number of Soldiers (usually 7) was assisted by two AIs. During one PE, the number of Soldiers per group was as follows: 2, 4, 4, 4, 5, and 7. (Four Soldiers were not accounted for in this PE).

Table 11
Execution Times for the TLOs in the Five-Day NET

Approximate Schedule	**TLO**	**Execution Times** (*minutes*)	
Day 1	Lesson 1001: Identify LW components and capabilities	45	
	Lesson 1002: Assemble the LW system	138	
Days 1 – 3	Lesson 1003: Operate the LW system	554	
Day 4	Conduct LW performance evaluation	(85)[2]	Perf. Eval. + Land Nav. for the Entire Class (292)[3]
	Lesson 1001: Day Land Navigation	(58)[4]	
	Lesson 1013: Maintenance & Troubleshooting Procedures	69	
Day 5	Lesson 1005: Boresight the LW weapon subsystem	89	
	Lesson 1006: Zeroing	258	
Senior Briefings/ Administrative Breaks/ Delays		188	
Total Time		1,633[5]	

[2] Five groups of Soldiers with three Soldiers in each group were tested at one time (a total of 15 Soldiers). The total performance evaluation times of these five groups were averaged.
[3] The total time for the class to complete the round robin for the Performance Evaluation/Land Navigation (292) was included in the total time for this NET.
[4] The land navigation event was observed for one group.
[5] Total time does not include delays for unit commitments.

The following TLOs/ELOs/PEs covered in the nine-day NET were not included in the five-day NET:

- Characteristics and operation of the TWS, zeroing and boresighting the TWS.
- PE for the STORM
- Image Editor
- PE for mission planning – create and apply missions (OPORDs) and overlays
- Familiarize with the LW support equipment
- Familiarization firing with the LW weapon subsystem
- Formations and Orders of Movement – Field exercises
- Employ LW system (plan, prepare, and execute a mission) – Platoon/Company Field exercise

Another difference between the nine- and five-day NET was that the purging and loading of the MDP was concurrent training during zeroing. Finally, the method for the performance evaluation was changed from a 1:2 evaluator/student ratio to a 1:3 evaluator/student ratio (5 stations were used).

System Overview

The PM-LW briefed the class and requested feedback from the Soldiers regarding the system.

The PI showed a slide presentation and reviewed similar information as the nine-day NET such as the characteristics of the three subsystems, mission data support equipment, VIK, CDA, and the advantages of the system. The PI also reviewed the basic characteristics of Mounted Warrior.

System Assembly

The PI provided an overview of LW routing and instructed the Soldiers to take all the cables apart and reconnect them. The PI then reviewed the assembly for the helmet and described the helmet as a hub such that it has a cable to the body subsystem, a cable to the Peltor headset, and a cable to the HMD. He also reviewed the assembly for the body subsystem and provided some instruction for left-handed firers.

The Soldiers then assembled the body subsystem. The AIs checked the Soldiers sizes, and some Soldiers inquired whether they could swap systems out for a better fit. The Soldiers were informed that they were most likely going to have to proceed through the NET with the wrong size and then they would receive the proper size from their unit. The body subsystems were already configured according to how their own company was wearing the system. That is, the body subsystems for the Soldiers in S Company had the computer on the back; R and T Company Soldiers had the computer on the side. The AIs also helped the left-handed Soldiers reconfigure their systems.

Next, the Soldiers assembled the helmet subsystem. Some Soldiers started assembling their helmet subsystems during the PE for assembling the body subsystems.

The Soldiers did not bring their weapons on the first day of the five-day NET, so the weapon assembly and instruction occurred on the second day of the NET. The Soldiers were instructed to only assemble their W6 and W10 cables and that the DVS is mounted on the left rail. The Soldiers mounted the DVS. A few Soldiers had difficulty mounting the PEQ-2A.

System Operation

In contrast to the nine-day NET, there were about two days versus three days devoted to system operation – functions related directly to the software interface. This classroom training also was structured similarly to the nine-day NET such that each block of instruction on a particular topic was typically followed by a demonstration (using a break out box) and a PE, which was usually performed outside. The PEs were conducted by the AIs who also reviewed the material covered in the classroom. The PEs were typically followed by a 10-minute break.

The following sections of this report provide an overview of the LW tasks and information regarding system operation covered in the five-day NET. The summaries are presented by topic (not in the order in which they were trained). The times associated with each topic are in Annex A. The topics covered were the following:

- Operate the SCU
- Start-up procedures and shut down procedures: power on, log on, and log off the LW system
- Configure the LW system (without navigation)
- GPS/DRD functions/calibration (navigation calibration)
- Map functions
- Overlays
- Digital communications: call for medic , SALUTE, free text
- Voice communications
- Operate the WUID
- Operate the DVS
- Operate the STORM
- Field Functionality Test
- Mission Planning
- MDP Loading and Purging

System start up and configuration. The Soldiers received similar information as the nine-day NET on how to don the system and power up the system. Soldiers broke into their groups and donned the system and powered up. The AIs helped the Soldiers log on and checked everyone's network status.

Next, the PI walked the Soldiers through configuring their systems. First, he demonstrated how to perform one configuration step, and then all the Soldiers configured this setting together. When everyone completed this step, the PI moved to the next configuration

setting. This was different than the nine-day NET where the Soldiers configured the system settings at the squad-level. The following settings were configured in this manner: left-handed settings, alerts – audible and visual, CNRS radio, and time. This block of training concluded with a safety brief and instruction on doffing the system and procedures on carrying and storing the system.

On Day 2, the PI continued with system configuration. Talk group configuration was covered first. It was explained that your role determines your talk groups. The URN menu selection on the talk group configuration display is configured to match the SAM card designation of the individual's role. For the five-day NET, the PI explained that the Soldiers would not have their correct roles; the unit will program these later. The PI demonstrated how to configure the talk buttons. The system used for the demonstration had a rifleman role, so only the first talk button could be configured. The second talk button could not be configured, because this duty position only has access to the first talk button. The PI demonstrated how to mute the talk groups and how to configure a talk group by sorting the groups.

The PI explained a change in the software since the previous NET iterations such that everyone within an Infantry Company should be able to talk to any talk group within the company (before a squad member could only talk to his squad). However, with this change, the bandwidth is now reduced because the network is opened up to everyone. Soldiers may hear a busy signal because too many people are on the network. The Soldiers will have more flexibility but less bandwidth. He said that this change will be good for the scouts, forward observers, and the specialty platoons who need communication with Battalion Headquarters (Bn HQ) and/or company leaders. Finally, the PI said that the system will go back to default (cancel out your selected talk groups) if the system is purged.

Next, the PI reviewed and demonstrated the configuration of the filter friendly SA. He explained that Soldiers click on the filter friendly SA and then setup the SA filter. The Soldiers received similar information as the nine-day NET to configure the SA filter. The PI also said that there has been a change in the software that allows Soldiers to select specific vehicles. Finally, the PI said that the unit will develop TTPs regarding linking to another organization and that icon/symbol clutter on the map display can be reduced by selecting only certain individuals and Strykers to track or display.

The PI also demonstrated the quick shortcuts for each configuration that had been presented in the nine-day NET.

This instruction was followed by a PE on configuration settings. The Soldiers divided into six groups, maintaining unit integrity. Size of the groups ranged from 3 to 7 people. Two groups were observed during the conduct of this PE.

The configuration of talk groups and SA filter were observed. For one group, the AI tried to get the group to configure the leaders on one talk group and the squad members on the second talk group, but the system had problems. So, he had them configure their SA filter by searching for the URN of the individuals to display on the map (see the configuration section for the nine-day NET).

For the second group, the AI helped the group put everyone on the same talk group. This was successful as each Soldier heard everyone in the group.

Navigation calibration. The Soldiers were provided similar information for the navigation calibration as the nine-day NET. One group of Soldiers was observed for the PE on land navigation configuration. The AI reviewed the "PSN" tab and the almanac setting on the calibration tab, which allows the system to save data. The AI also explained that to jump start the GPS the Soldiers can input a buddy's 10 digit grid (the Soldier doesn't have to put in all 10 grid coordinates. He instructed the Soldiers to calibrate at least one time per day. He explained that the GPS also downloads the time and that if the almanac has aged the time can be set to acquire satellites faster.

Map functions. The PI covered the same information for map functions as the nine-day NET such as the map screen and toolbars, capability to zoom in, pan, and measure distance (meters) and direction (azimuth), how to select, move, and undo symbols, and how to edit, store, and turn on and off overlays.

One group of Soldiers was observed for the PE on map functions. The group was instructed to put two coordination points on the map and name them. They also received additional instruction to turn the "OPS" overlay on, add a symbol, and edit the coordination points by going to the edit screen or bottom mouse click. Then, they measured the distance between the two points, moved the first point, and stored the overlay. The AI also explained that the "Hide Anno" button shows the name on the map but erases the symbol. Finally, the group was instructed to make the enemy overlay active and put an enemy tank on it.

Overlays. The instruction for overlays was similar to the nine-day NET. The PI created an "OPS" overlay and "ENY" overlay, so the Soldiers could see the blue (friendly) and red (enemy) symbols and how the two overlays are viewed at once. He then demonstrated how to turn the overlays off. He explained that the overlays are a part of mission planning such that an order (WARNO/OPORD/FRAGO) is created and then an overlay is attached to that order. To send an overlay you can either attach it to a mission or send it by itself. The mission section of the system was displayed so that the Soldiers could see the display screen where the orders are created. Two AIs demonstrated sending and receiving overlays. The PI explained that if the overlays were sent with a mission then they would have a mission ID#. One AI "opened" and "applied" the overlays. When overlays are applied, they move to the map and a new echelon, corresponding to the sender of the overlay, is created on the left-side map toolbar. The PI explained that the overlay has to be copied before it can be modified (Soldiers cannot modify someone else's overlay – they have to copy it as their own and then change it). The PI said that you do not want to delete overlays from higher; just create new ones based on these. The AI also demonstrated how to move symbols (clicked on the symbol and then clicked on the grid - the soft keyboard appeared and the AI changed the grid coordinate by 100 meters.

The PI also conducted an exercise with the entire class in which the Soldiers created an overlay and sent it to an AI.

The PE for creating and sending overlays was integrated with the call for medic PE. Once group was observed. They created an operations overlay and turned the "OPS" menu selection blue so that it was writeable. The Soldiers added a checkpoint and a coordination point. They stored the overlay. The AI explained that if the Soldiers do not store the overlay, then the system will not save the overlay and the Soldiers will be unable to send it. The AI explained that when the Soldiers send the overlay they have to select the recipients, as there are no default recipients. The Soldiers' selection will stay in effect as long as the system is powered up - the selection will not stay during a power down. To send an overlay, the Soldiers were instructed to go to the mission section and select a buddy to send it to. Then, they opened and applied the overlay they received and toggled on the "SLF" and "USR" menu selections.

Digital messages. The PI covered the same information for digital messages as the nine-day NET. He also demonstrated sending a free text message and showed how messages can be protected from being deleted. For the PE, the Soldiers practiced creating and sending text messages.

The PI also conducted an exercise with the entire class on creating and sending free text messages. The PI conducted a check-on-learning by facilitating a "Jeopardy" (TV show) type exercise in which the Soldiers were asked to send their answer to an AI in a form of a question. The Soldiers were instructed to capitalize the first letter and put a question mark at the end. They also were instructed to send the message as an immediate priority.

The instruction for call for medic was similar to the nine-day NET. The PI demonstrated a call for medic and cancel medic using the SCU and the map (2 AIs demonstrated calling and cancelling medic). For the PE, the Soldiers configured the recipients of their call for medic so that the message would only be sent to individuals within their group. Then, one group was observed calling for the medic and then cancelling the message.

The PI also covered similar instruction for creating and sending a SALUTE report using the map functions as the nine-day NET. Then, the PI demonstrated sending a SALUTE message. The PI explained that when the message is sent it populates everyone's map that is in range (even when they are not the recipient of the message). Strykers also are on the list, and the report populates the FBCB2 (Force XXI Battle Command Brigade and Below) screen in the Stryker vehicle. The VIK translates information from the LW systems to the vehicle. Finally, the AI sent another report and explained that only key personnel (the chain of command) can modify someone else's report.

The PI then provided information on the CFF message similar to the nine-day NET. The AI demonstrated the call for fire message (received message, viewed map, and stressed that it has to be approved).

No PEs were conducted for SALUTE and CFF message.

Voice communications. The instruction on voice communications was limited to configuring the talk groups. After the PE on configuring the talk groups, the PI briefly discussed bandwidth issues and the range of the Soldier radio.

Operation of weapon devices (DVS, STORM, WUID). The PI provided similar information regarding the operation of the weapon devices as the nine-day NET such as the different FOVs, the sighting adjustment configuration screen, the TWS, and the STORM. He also demonstrated the configuration screen for the DVS, how to toggle to the DVS using the WUID, and how to rotate through the FOVs. Finally, he discussed the changes that have been made to the weapon subsystem since the nine-day NET.

The PE on the WUID was included in the PE on the configuration of talk groups and SA filter. One group was observed. The AI repeated similar information as in the classroom instruction such as how to change the DVS reticle type, mechanical zero, "center adjust reticle," how to toggle between TWS, map, and DVS, how to toggle between the different FOVs, and the location of the talk group button. Finally, he reviewed the DVS and had them go to the WFOV. The PE did not include the TWS or STORM.

Field functionality test. For the FTT, the Soldiers were told to check the batteries and cables before performing the FFT. Then, they used the Quick Reference Guide to perform a FFT. During the PE, the Soldiers also reviewed for the performance evaluation.

Mission planning. The PI indicated they usually spend an entire day on this but this section was shortened for the five-day NET. He demonstrated receiving one field order and two overlays. He opened the field order; this had the mission ID#. When applied it goes to the mission section (out of the Inbox). When the overlays are applied they do not apply directly to the map because they are linked to a specific mission. So, the Soldier has to make the mission active in the mission section to view the overlays. It is not possible to delete an active mission. The PI demonstrated that once the new mission is made active, the "USR" layer now has no symbols because the previous symbols (made throughout the class) were not attached to the active mission. There was no mission planning PE except for the overlay PE described earlier.

MDP purging and loading. The AIs provided instruction regarding purging and loading the MDP to the Soldiers as concurrent training during zeroing. This training was not observed.

Performance Testing

The PI provided an overview of the training day (Day 4). One half of the Soldiers were tested on the LW system while the other half conducted a land navigation test. The Soldiers donned the systems, powered up, and performed a FFT. The PI passed out numbers to all of the Soldiers so that they knew which group they would be tested in and at which table. The Soldiers also were given the standard for passing the exam (70% on all non-critical tasks; 100% on all critical tasks). The Soldiers would be retrained if they missed any of the critical tasks. The Soldiers were tested on the same tasks as the nine-day NET (see Annex B). The first half of the Soldiers to test was observed. Three Soldiers were tested simultaneously by one instructor. Five groups of Soldiers were tested in the first half for a total of 15 Soldiers.

The Soldiers who were tested were instructed to power down, and the trainers disassembled their equipment for the assembly portion of the exam. The batteries and cables

were removed from the body subsystem (BSS); the HMD and EPLRS headset removed from the helmet subsystem (HSS); and the DVS removed from the weapon subsystem (WSS). Then, the Soldiers were brought back into the classroom and were instructed to assemble the LW system.

See Table 6 for the performance exam results. The start and end times for the five groups were recorded (Table 12).

Table 12
Times for the Performance Evaluation for the First Five Groups of Soldiers – Five-day NET

Group	Start Time	End Time	Entire Exam
1	0856	1037	101
2	0855	0951	56
3	0854	1000	66
4	0901	1120	139
5	0855	0956	61

Observer comments. The performance test for the five-day NET was the same was for the nine-day NET. However, the time spent training the same content was about one day less for the five-day NET. Not all areas were covered (e.g., PE for STORM and TWS), so the reduction in content somewhat balanced the shorter training time. In addition, the ratio of instructors to Soldiers was better (fewer Soldiers per instructor), which allowed for more individualized instruction. The similar results for the nine- and five-day NETs suggest that the performance test was not a rigorous test of the Soldiers knowledge of or ability to employ the system. Rather, it tested the Soldiers on basic operator tasks.

Individual Land Navigation

The land navigation course was conducted as round robin training with the performance evaluation exam. One group (13 Soldiers) was observed. The entire course had 12 points. Each Soldier was expected to find the four points corresponding with their start point (there were three start points). The AI said that the purpose of the course was to allow the Soldiers to experience navigating with the system. Soldiers were instructed to calibrate their compass and put four symbols to represent the grid points on their maps. The AI said that this was just a technique (editing a symbol to match the grid coordinate). The AI said that the symbols are large and that Soldiers may want to make these smaller so that they can see more of the map. He also said that they needed to zoom in to find the points, as some were only 25 meters apart.

The first Soldier to start the course finished in 15 minutes. Another noncommissioned officer (NCO) who attended the Master Trainer Course in December 2005 finished the course in nine minutes. All Soldiers were finished in 58 minutes. The AI checked everyone's points; all Soldiers received Gos.

Observer comments. Soldiers were required to find the same number of points as in the nine-day NET; however, the course covered a much smaller area and had less points

placed throughout it compared to the nine-day NET course. These factors explain why some Soldiers expressed that the course was a fairly easy exercise.

Maintenance and Troubleshooting

The Soldiers received similar instruction on maintenance and troubleshooting as the nine-day NET such as the maintenance concept after fielding, the BIT screen, performing PMCS, and recording deficiencies on DA Form 2404. The Soldiers identified and recorded any defaults on DA Form 2404. The Soldiers inspected their systems and recorded any deficiencies on the form. They also recorded if they were missing any items. For the PE on troubleshooting, the Soldiers reviewed each of the troubleshooting steps in the QRC.

Marksmanship

Boresighting the DVS. There were eight instructors and 29 Soldiers for this training event. Ten boresight lanes were used. An AI provided an overview of boresighting. Eight Soldiers had already boresighted the DVS. The noncommissioned officer in charge (NCOIC) said that the privates should boresight again, but that the NCOs could decide whether they wanted to boresight again. The PI explained the borelight process and sequence. The Soldiers were instructed to turn the paper around after they boresighted and put the dot on the center mass to adjust the DVS reticle for the offsets. They were instructed to adjust the reticle in the DVS so that the reticle is aligned to the offsets in both the wide and narrow FOVs.

When the Soldiers started to borelight, the NCOIC provided instruction on how to stabilize the weapon by putting straps around the weapon and putting a rock under the board to elevate it. One AI reviewed how to adjust the reticle.

The times for two Soldiers were recorded. The first Soldier did not have to make many adjustments to boresight. He then made the reticle adjustments. The two tasks were completed in a total of six minutes. The second Soldier finished making adjustments to boresight in 11 minutes and had to receive additional instruction on how to adjust his reticle. The Soldier finished making the reticle adjustments in eight minutes. Both tasks were completed in a total of 19 minutes. He then recorded his reticle adjustments.

Observer comments. The PI instructed the Soldiers to use the back of the target to boresight but other trainers said that it did not have any gridlines and that it would have been easier to use the side with gridlines when making adjustments.

Zeroing the DVS. The Soldiers first received a safety brief by the NCOIC. He also instructed the Soldiers to first get a sight picture, remember the fundamentals, and push forward against the sandbags to get stable. The Soldiers zeroed in prone position. There were 13 firing points with approximately two firing orders. They were instructed not to make adjustments after the first three shots; these rounds are used to ensure that the DVS is properly mounted to the rail. The second three shots are for grouping, and the third three shots are to confirm the group and make adjustments to center mass. They were instructed to zero in the WFOV and then in the

NFOV. The NCOs and trainers checked the groupings and provided feedback for the Soldiers to make adjustments. The shortest time to zero the DVS was 52 minutes.

Additionally, the SAW Gunner has to fire one round at a time so it is very difficult for him to maintain a stable position because he has to reload after every shot. One of the AIs tried loading his weapon for him. The SAW Gunner also tried firing from the foxhole because he said he was having a difficult time seeing through the grass in the prone position.

After Soldiers zeroed, they first completed the NET survey (see Annex E) and then attended the system purging and MDP loading class.

> *Observer comments.* Some Soldiers explained that they made adjustments according to the borelight procedures which are the opposite of zeroing adjustments. They said that they were completely off of the page with their first couple of shot groups and said they had to adjust all the way back. These procedures should have been explained in NET as they can be quite confusing to individuals. Also, some said that their first few shot groups were terrible, and others said that it was easier in the NFOV than in the WFOV because it was clearer.

Mission Data Support Equipment (MDSE) Training

The MDSE training was a 32-hour program conducted 5 – 8 June 2006 intended for selected Battalion personnel. The purpose of the course was to train leaders to develop Mission Data Packages (operations orders, maps, and overlays) using the MDSE software. The MDSE software must be used to transfer the MDP and programmed SAM cards to the LW systems worn by the Soldiers. Panasonic Toughbooks were used as the hardware for the MDSE software. Since two companies were attending the NET during this time frame, only a few of the 17 personnel who attended the course were actually platoon, company, and battalion leaders who needed the training. The course did not focus on planning per se, but only on how to operate the software. The original plan was for the MDSE course to come before any NET, but the lack of equipment did not allow this to occur.

Only a portion of the course was observed. The lesson plan outline is presented below:

- Components of MDSE
- Operate MDSE
    - Create and manage mission
    - Create and manage field orders
    - Manage map data
    - Create and manage overlays
    - Manage images
    - Manage unit task organization
    - Manage a mission data package
    - Create and manage Soldier access module cards
    - Export a vehicle integration kit
    - Purge data from MDP

- Support equipment
- Troubleshooting

Training Support Materials and Equipment

The training support materials consisted of the following items:

- An Operator's Guide that included the steps required to complete the major LW tasks and system safety warnings. A limited number of features and tasks had supporting black and white graphics, which were presented in the last section of the guide, separate from the description of the steps (map toolbar and docking toolbar, top and bottom information bars, create a message, add/select a symbol, place symbol on a map, enable alerts, calibrate compass, distance and direction, delete an echelon, and mute talk button 1). The table of contents for the Operator's Guide is in Annex A.
- A laminated QRC that included start up procedures and troubleshooting procedures for the LW ensemble, the VIK and the vehicle based charger. It also included the steps for what was called "Field Functionality Test" – similar to a Pre-combat check list. The specific topics covered in the QRC are listed in Annex A.
- Copies of the Power Point slides used in Week 1.
- A video-tape on reduced exposure firing

Observer comments/recommendations. The following suggestions are made regarding how the training support materials and equipment could be enhanced/improved/changed. They are from the perspective of providing the unit receiving NET with the materials they need to sustain training independently and to train new personnel, as well as making training more efficient.

Operator's Guide. The Operator's Guide should be retained. However, it should be reorganized to provide a logical sequence in the initial learning of the system and as a reference document. Although it currently starts with the tasks of inspecting and assembling the system, the next topic is map functions, without any explanation of how the software interface is structured/organized and the general purpose of the separate sections of the interface. In addition, configuring the system should be covered early in the guide as it is basic to many of the other functions. Any duty specific tasks should be separated from general tasks/skills. The guide could be made more user-friendly by integrating colored screen captures of critical screen displays and key steps. Color displays are important when the interface uses color as a code for functionality. Screen captures can be reduced in size to show multiple, linked steps on the same page to facilitate understanding on part of the user. All major screen displays should be presented and annotated to clarify the functions associated with the display. Lastly, the Operator's Guide should cover all LW functions.

Changes in format could also make the Operator's Guide more user-friendly. For example, if possible, all steps for a given function should fit on a single page, or the front and back of one page. Unnecessarily splitting the description of a function across pages inhibits understanding and use of the Guide as a reference document. In addition, the

format for some Notes, using a bold header, made them seem more important than the actual steps.

QRC. The QRC should be retained and updated as required to accommodate the latest changes in software and updates to troubleshooting procedures.

Reduced exposure videotape. The videotape should be updated as required to show the latest version of the system. In addition, it should be edited to show empirically verified firing positions that are stable and have been shown to be effective (Soldiers hit targets from these positions). Any positions currently shown in the tape that are not supported by empirical data should be removed. Any new positions that are shown to be effective should be added. The probabilities of hit that can be achieved at different target ranges, using the cited fields of view) with trained Soldiers should be incorporated in the tape as well. Similar improvements in the videotape apply to observation techniques using the reduced exposure capability. The video should also be updated to show tactical situations where reduced exposure firing techniques will not work and why they won't work. The video should also show views of the firer from a distance so the Soldiers get a better picture of why they are more survivable in reduced exposure positions.

Job aids. Add a job aid on zero adjustments for the DVS (each FOV) and the TWS. This should save time during the zeroing process and insure accuracy in the adjustments. It is very difficult to remember these technical details.

Technical information. For unit trainers and senior personnel, there should be a packet of technical information that provides the necessary background for understanding how the LW system works. This should not be an engineering document, but should clarify principles critical to the technology and also addresses questions that Soldiers might ask. This document should be updated as LW personnel learn more about what is needed and what personnel want and need to know. For example, there should be a document that explains the network structure and functioning. Another example is a document that explains the reason for the menu and menu selections in the messages, i.e., Joint variable message format (JVMF) compliant to communicate with FBCB2, etc.

Structured exercises. A set of individual practice exercises and collective employment exercises are needed for sustainment on critical skills. The exercises conducted for NET were limited in terms of providing Soldiers with opportunities to practice LW skills. There was much down-time during the classroom exercises as Soldiers who finished the tasks early waited for others to finish. A variety of exercises are needed so that Soldiers can practice LW skills by performing different types of tasks. Further, Soldiers should practice LW skills individually in the field prior to collective exercises. This will allow the Soldiers to experience using the system in more realistic situations and prepare them for squad exercises. Finally, the unit should be provided with a set of collective exercises that stress the logistical system, highlight the advantages of the system, and assist in the proficiency of LW employment skills.

Equipment to monitor Soldier interaction with the software interface. Figure 8 shows what a trainer had to do during the PEs to help a Soldier or determine whether the steps the Soldier had performed resulted in a correction solution/screen. The trainers had to rotate the HMD and personally examine each Soldier's display. There was no means to simultaneously monitor Soldier actions as they were being performed in order to diagnose problems or determine the level of Soldier expertise. This process was very time-consuming. Because of the time required, not all Soldiers could be examined, and the trainers often had to rely on Soldier feedback only. Hand-held displays and monitors that can be linked quickly to each Soldier's system would greatly assist the training process, leading to both more efficient and more effective training. Trainers need a device that can be used in classrooms as well as in outside training area/field exercise environments.

Figure 8. Trainer using the LW HMD to examine Soldier progress.

MOE 2.3.3: Sufficiency of the NET POI – End-of-Course NET Survey

Method

A survey on the NET was given to the Soldiers after they had participated in NET. The survey was administered after NET had been completed for each company and the five-day NET. For each company the survey was administered after its company NET. For the five-day NET, the survey was administered on Day 5, after Soldiers had completed the performance test.

The survey was developed by the Human Research and Engineering Directorate (HRED)-Knox, working for ATEC, with input and revisions provided by a DOTMLPF assessment working group. A representative from HRED –Knox administered the survey to the Companies. An ARI representative administered the survey to participants in the five-day NET.

The NET survey questions, designed for the nine-day NET covered overall reactions to the training, reactions to the first week of training which was in the classroom, reactions to the field exercises in the second week of training; confidence in performing a sample of tasks; extent to which Soldiers were prepared to conduct field exercises, and perceived difficulty of learning selected tasks. Soldiers could also write-in any comments they had regarding the LW training.

Results

Respondents

The number of Soldiers completing the surveys from three companies was low, a total of 79. The percentage of Soldiers from each company was 24% (24 of 101), 34% (32 of 94), and 23% (23 of 98), respectively. These return percentages were based on the number of Soldiers who took the Performance Test. The corresponding percentage for the five-day NET was substantially higher 89% (26 of 30).

In addition, the Soldiers who responded to the survey who had the nine-day NET were not representative of the duty positions within the companies. Based on total numbers in the battalion, Table 13 shows the percentage of Soldiers by duty positions who completed the surveys. Duty positions cited in this table account for 70% of the surveys that were returned. The results in the Table 13 also indicate that the Soldiers who responded were not in comparable duty positions in all three companies. The other duty position category includes personnel at battalion level who were integrated into the company NET training. The duty positions of the Soldiers in the 5-day NET are also shown in the table.

Table 13
Percentage of Soldiers who Completed the End-of-Course NET Survey

	Percentage of Soldiers Returning Survey based on Total # in Battalion	**# Soldiers Completing Survey by Duty Position**			
Duty Position	9-day NET for R, T, and S Companies	R	T	S	5-day NET[a]
Company Commander	67%	0	1	1	0
Executive Officer	67%	1	0	1	0
First Sergeant	0%	0	0	0	0
Platoon Leader	22%	0	0	2	1
Platoon Sergeant	44%	0	2	2	1
Squad Leader	17%	0	4	2	3
Team Leader	20%	2	5	4	6
Fire Team positions (rifleman, automatic rifleman, grenadier, machine gunner)	16%	4	15	9	8
Other positions		17	5	2	7
Total number returning survey		24	32	23	26

Note. Only primary company duty positions are cited in the table.
[a]5-day NET numbers are not included in the percentages in the second column.

Soldier Responses

Rating scales. Clearly, the small samples from the three companies were not representative of all the Soldiers who participated in NET. In addition, there were changes in the system and in the NET training from one company to the next. Given these discrepancies, comparisons of the three company NETs were not justified. Instead, the data from all the nine-day NET was combined and compared to the data from the five-day NET. The analysis was limited to descriptive statistics. This section of the report presents a series of tables of the mean ratings for the nine-day and five-day NET. Results on all survey questions are shown.

Table 14 shows the mean ratings for three areas: overall training, classroom training which was the first week, and field exercises which was the second week. There are two trends in this set of results. One is that the ratings were generally favorable. The exception to this trend was the rating of 3.58 regarding system performance from Soldiers in the nine-day NET. The second trend was that for every question, the ratings from the five-day NET were higher than the nine-day NET.

Table 14
Mean Adequacy Ratings for Training- NET Survey (higher number indicates more favorable rating)

	NET			NET	
	9-day	**5-day**		**9-day**	**5-day**
Overall Training			**Classroom Training Week 1**		
Delivery of instruction	4.94	5.54	Time for classroom instruction	4.59	5.58
Instructor knowledge	5.08	5.69	Time for PEs	4.82	5.46
Opportunity to ask questions	5.23	5.88	Usefulness of the PEs	4.86	5.46
Instructor to student ratio	4.82	5.50	Organization of topics	4.85	5.42
Use of instructional aids	4.95	5.69	Use of classroom time	4.56	5.62
Usefulness of take-home material	4.81	5.42	Hear instructor and see overhead projection	5.21	5.81
Performance of the LW system	3.58	4.77	Tasks & skills in performance test	4.99	5.77
Field Exercises Week 2					
Time for field exercises	4.55	5.14			
Usefulness of map & navigation exercises	4.57	5.13			
Usefulness of firing exercises	4.32	5.46			

Note. Rating scale. 1 = completely inadequate; 2 = mostly inadequate; 3 = somewhat inadequate; 4 = somewhat adequate; 5 = mostly adequately; 6 = completely adequate.

Another question focused on the overall adequacy of the training, but used a different rating scale. The question was "To what degree did the classroom training prepare you to effectively perform the field training exercises as a member of a unit?" The scale was 1=did not prepare me at all, 2=prepared me only a little bit, 3=generally prepared me; 4=mostly prepared me, and 5=completely prepared me. Mean rating was 3.49 for the nine-day NET and 4.12 for the five-day NET.

Soldiers were asked about their confidence in performing individual tasks after training. A total of 19 tasks was addressed, plus a general question on preparation for the Soldier's duty position. The results for the nine-day and five-day net are shown in Table 15. Again, the ratings were favorable. Typically the ratings for the five-day NET were higher. However, there were four tasks for which the nine-day NET ratings were higher: create/send/receive digital messages; download MDP, create a mission, and create/edit/copy/issue orders.

Table 15
Mean Ratings on Soldier Confidence in Performing Tasks: NET Survey (higher numbers indicate higher confidence levels)

	NET			NET	
Task	**9-day**	**5-day**	**Task**	**9-day**	**5-day**
Assemble system	5.10	5.62	Create overlays	5.19	5.46
Don/doff system	5.71	5.81	Send overlays	5.10	5.54
Power up / log on	5.85	5.85	Receive & apply overlays	5.32	5.58
Perform field functionality test	5.65	5.81	Create, send & receive digital messages	5.78	5.69
Configure digital & voice commo	5.57	5.69	Manage digital messages	5.77	5.65
Configure SA filter	5.63	5.65	Use voice commo	5.67	5.60
Develop map overlays	5.39	5.46	Operate weapon subsystem	5.38	5.50
Download MDP	5.06	4.73	Perform PMCS	5.19	5.50
Create a mission	4.84	4.77	Perform troubleshooting	4.73	5.38
Create/edit/copy/issue orders	5.01	4.92	Use LW to perform my duty position responsibilities	4.68	5.16

Note. Rating Scale. 1 = not confident at all; 2 = generally not confident; 3 = somewhat not confident; 4 = somewhat confident; 5 = mostly confident; 6 = completely confident.

The last set of questions was on difficulty in learning tasks in six domains. Ratings were again favorable, indicating tasks were not perceived as difficult. Soldiers in five-day NET gave higher mean ratings to each of the six dimensions. Results are in Table 16.

Table 16
Mean Ratings on Difficulty to Learn for Six Skill Domains: NET Survey (higher rating indicates less difficult)

	NET			NET	
Skill Domain	**9-day**	**5-day**	**Skill Domain**	**9-day**	**5-day**
Land navigation tasks	4.39	4.62	Voice communications	4.58	4.77
Situation awareness overlays	4.52	4.65	Weapon subsystem	4.44	4.50
Digital communications	4.62	4.81	Mission management	4.09	4.62

Note. Rating Scale. 1 = extremely difficult; 2 = moderately difficult; 3 = fairly difficult; 4 = only a little difficult; 5 = not at all difficult.

Free-response comments. The ratings were generally on the positive end of the scales. On the other hand, the free-response comments typically suggested improvements to the training. There were a total of 97 comments of which 30 were devoted to needed changes in the system.

The system-related comments are not summarized here, but these comments indicated that system problems interfered with Soldiers executing tasks during the training.

Many individuals provided multiple comments, as only 52 individuals responded. Of these 52 individuals, 46 commented on training. It should be noted that the NET survey focused primarily on the first-week of training; with much fewer questions on the second week of training. It appears that this may have influenced the number of comments regarding the first week, as comments could be inserted after each block of questions as well as at the end of the survey.

Many comments focused on the balance of training time - specifically too much classroom time with more time needed for practice exercises or field time, and that they thought the classroom training could have been conducted faster. The need for a smaller class was also cited. Other comments related to need to tailor the training, the quality of the instructors, the need for more training, level of difficulty of the instruction/test, and boresighting. A numeric summary of these comments is in Table 17.

Table 17
Comments on Training From the NET Survey

Comment Topic	**# of Individuals**
• More time needed for field and/or PEs; less classroom/lecture time	13
• Reduced classroom time through restructuring, fewer breaks, condensing material	13
• Smaller class size; small group instruction worked better, individuals not pay attention with big groups	8
• Need more training time: more field work to learn what works, still learning some tasks; not enough on overlays and missions, need more on MDSE; troubleshooting and maintenance inadequate – dependent on contractor logistic support; more time behind the weapon	11
• Need to tailor the training: nothing specific for medic, team leader and below get general/squad leader and above get orders and overlays	4
• Instructors were knowledgeable, professional • Instructors were not knowledgeable	9 2
Other comments • Performance test was too easy • Instruction too elementary, unnecessary PEs • Take home material not user-friendly • Too much equipment to boresight, takes too much time	 1 2 1 2

Discussion of the End-of-NET Survey Results

In general, the ratings were quite positive. The lowest overall rating was on system performance (see Table 14). For those in the nine-day NET, these ratings were almost evenly divided between negative and positive -- 44% provided negative adequacy ratings while 56 % provided positive ratings.

As pointed out in the results section above, the Soldiers in the five-day NET almost always provided higher ratings than Soldiers in the nine-day NET. There could be several reasons for this trend and it is not possible to determine the primary reason. First, the class was smaller, resulting in a more favorable training environment. Second, there were few Soldiers per instructor than was the case in the nine-day NET. Ratio went from approximately 9 to 1 for the nine-day NET to 4 to 1 for the five-day NET. Third, system improvements had been made, which could have impacted Soldier perceptions. In addition, these three factors could have jointly had a positive impact on the ratings.

The fact that Soldiers in the five-day NET provided higher ratings on their preparedness for being a member of a unit in the field training exercises is of interest, as these Soldiers did not have any collective exercises during NET. This particular result may simply reflect the overall more favorable impression of training that occurred with the five-day NET.

The comments to the survey indicate some areas that can be improved in future NETs. The large class size could have impacted the Soldiers' perceptions about the relative balance of lecture to PE time. The actual course time data collected during the NET observations show that the PEs took twice as much time as the lecture. So the overall times favored PEs, not lecture, during Week 1. However, as noted in the prior section on Training Observations, during the PEs there was frequent downtime for each Soldier. Typically a Soldier only did one or two exercises during a 50-minute block of time. Thus actual hands-on time or time-on-task per individual was limited and may have contributed to these comments about an imbalance in time.

Clearly, the large class size related to the preference by some Soldiers for smaller group instruction. The size probably also contributed to the inefficiencies in use of training time, as indicated by other Soldiers. In addition, the large class inhibited tailoring the training to duty position requirements, a desired change cited by some Soldiers.

Lastly, the need for more training time in specific areas listed by some Soldiers indicates a requirement to insure in any future NET that every Soldier is technically proficient, tactically proficient and confident in the use of his system. Despite the limited number of comments and the non-representative sample for the NET survey, the comments do provide indicators of where and how the LW NET could be improved.

MOE 2.3.3: Sufficiency of the NET POI – Consolidated Survey, Focus Groups, and Lethality Experiment

Three other data collection efforts provide information relevant to the MOE 2.3.3 regarding the sufficiency of NET. Two efforts, the consolidated survey and focus groups, were conducted at the same time in October after the Company combined arms live fire exercise (CALFEX) had been conducted. TRADOC Analysis Center- Monterey (TRAC-MTRY) personnel were responsible for the surveys and focus groups. However, input to the survey and focus group questions was provided by individuals responsible for different aspects of the DOTMLPF assessment, and consolidated by TRAC-MTRY. Training questions were included in the surveys and in the questions addressed to the focus groups. The "raw" data from these two sources were provided to ARI for the training analyses. The third data source was a lethality experiment on reduced exposure firing. The Army Materiel Systems Analysis Activity (AMSAA) analyzed the data and provided the results to ARI to support the training MOEs.

Consolidated Survey

The consolidated survey included questions in two domains very relevant to MOE 2.3.3:

- Frequency of use of selected LW functions during unit training after NET
- Phase in training when individuals felt confident regarding their proficiency with selected LW functions and tasks

Some additional training questions were asked, e.g., how often should perishable skills be trained. Lastly, background data on the survey participants were important both to describe the sample and to determine whether these variables, e.g., duty position and rifle company, related to how individuals responded to the survey. The survey is at Appendix F.

A total of 238 individuals completed the consolidated surveys. There were two versions: one for leaders (team leader and above) and one for nonleaders. The number of leaders who took the leader survey was 118; 120 nonleaders took the nonleader survey. All questions in the nonleader survey were included in the leader survey. The leaders had additional questions appropriate to their leadership roles within the company and battalion, and LW equipment unique to specific leader positions.

Consolidated Survey Results

The Soldiers

The background questions were the same in the leader and nonleader surveys. This section summarizes results on the major background variables of interest in the training analyses. The numbers of individuals who took the survey were similar for the three companies (see Table 18).

Preliminary analyses indicated no major differences among the companies on the background variables, so Table 19 presents the characteristics for the entire sample. Since the mean values for age, years in service, and number of deployments were much lower than the maximum value, the results suggested that, in general, the sample consisted of younger, less

experienced Soldiers. Specifically, 68% were ≤ 24 years of age; 58% had served only two years in the Army; and 66% had not deployed yet.

Table 18
Consolidated Survey: Participant Numbers by Company and Survey

Survey	**Company**			
	R Co	T Co	S Co	Other (Bn)
Leader	43	37	26	13
Nonleader	35	38	37	10

Table 19
Consolidated Survey: Background Variables

Background variable	**Minimum**	**Maximum**	**Mean**	***SD***
Age (*n* = 237)	18	44	24.19	4.57
Years Army Service (*n* = 233)	0	19	3.73	3.66
Years Active Service (*n* = 228)	0	19	3.50	3.52
Months in Duty Position (*n* = 237)	0	48	9.60	7.57
Number of Deployments (*n* = 230)	0	6	0.53	1.01

Table 20 presents a cross-tabulation of the ranks of individuals with their duty positions within the battalion, as reported in the survey. These data were not taken from company or battalion records. In general, the reported ranks were consistent with the reported duty positions. The major exception to this generalization is that only 30% (9 of 30) of the team leaders within the rifle platoons held the appropriate rank of sergeant. Team leader is a skill level 2 position. The remaining team leaders held the rank of corporal, specialist, or private, all skill level 1, below the designated rank of a team leader. There were some junior NCOs in two other positions as well, platoon sergeant and squad leader. For rifle platoon sergeants, 63% (5 of 8) were at the designated rank of sergeant first class with the other platoon sergeants holding ranks for staff sergeant and sergeant. For rifle squad leaders, 63% (20 of 32) were at the designated rank of staff sergeant. The other squad leaders held ranks of sergeant first class (higher than the designated rank), sergeant, and specialist.

Table 20
Consolidated Survey: Rank by Duty Position

Duty Position	**Rank**									
	CPT	LT	1SGT/ MSG	SFC	SSG	SGT	CPL	SPC	PVT	Total
Co Cdr	**3**									3
Co XO	1	**2**								3
1SGT			**2**							2
Rifle: Platoon leaders		**7**		**5**	2	1				15
Rifle: SL				5	**20**	5		2		32
Rifle: TL						**9**	3	16	2	30
Rifle: Fire team members							1	**34**	**37**	72
MG team							**2**	**16**	**14**	32
Eng platoon leaders		**1**		**1**						2
Eng SL					**1**	**2**				3
Engineers								**4**	**1**	5
Recon: Platoon leaders		**1**		**1**						2
Recon: TL					**1**			3		4
Recon: Scout								1		1
CO FSO Off/NCO		**2**			**1**					3
FO						**2**	1	2		5
Medic								**8**	1	9
RTO								**5**	**1**	6
Veh Driver								**3**	**1**	4
Sniper								**2**		2
Total	4	13	2	12	25	19	7	96	57	235

Note. Numbers in bold indicate cells where the rank was appropriate for the duty position.
Note on sample size. A total of 238 individuals took the consolidated surveys. Three are not included in the table because information was not available on both rank and duty position, or because rank and duty position were inconsistent. One individual marked his duty position as "other" and rank as "SPC." One individual's duty position was marked as "platoon leader" and rank was "CW2." One individual did not indicate his rank, but duty position was "rifleman."
Note on rank. LT category includes 1LT and 2LT; PVT category includes PVT, PV2, and PFC. PVT, SPC and CPL are all skill level 1 Soldiers.
Note on duty position. The "platoon leaders" category includes both the platoon leader and the platoon sergeant.

Many of the training analyses compared leader to nonleader responses, or looked at leader responses only. The distinction between leader and nonleader responses was based on the survey each individual completed, as leaders had some additional, unique questions. As

indicated previously, for purposes of the survey a leader was defined as those in team leader positions and above plus forward observers in order for them to answer the fire support questions in the leader survey. However, it was later determined that some individuals were inadvertently given the wrong survey.

Examination of individual duty positions by the survey taken (leader or nonleader survey) revealed the extent of this error. Of the 118 leader surveys, 16 (14%) were completed by nonleaders. The major discrepancy occurred within the weapons squad, where individuals (n = 12) indicated they were a leader of a machine gun team and therefore completed the leader survey. Technically, the leader of a machine gun team is not a MTOE (modified table of organization and equipment) position. Three rifle team members also inadvertently completed the leader survey. Of the 120 nonleader surveys, three (3%) team leaders completed the nonleader survey. Overall, 8% of the sample (19 of 238) completed the wrong survey. Despite these discrepancies, the leader and nonleader analyses were conducted as planned, that is, by survey taken.

Frequency of Using LW Features After NET (Section II on Basis of Issue, Question 1 of the Survey)

Soldiers answered a series of items on how frequently they used a variety of LW features or functions in unit exercises after NET, e.g., frequency sending a CFF message, frequency of modifying an overlay. The response options were "never," "infrequently," "sometimes," "frequently,", "always," and "N/A, did not have the function." To summarize these results, the three response options of "sometimes," "frequently," and "always" were combined for each function. This sum was treated as an indicator that the function was "***used"*** by a Soldier. The responses of "never" and "infrequently" indicated that the function was not used. For each function, the percentages of leaders and nonleaders within each rifle company who used the function was then tabulated. The numbers of leaders and nonleaders within each company who completed the surveys were given previously in Table 18. These numbers apply to the analyses that follow except for any missing data that happened to occur.

The results in Tables 21 through 25 show the percentage of individuals within each rifle company who used a function, as well as the percentage of leaders and nonleaders who used each function. Significant differences among the rifle companies and between the leader and nonleader duty positions are cited in the last column of these tables. These differences were based on a series of five multivariate analyses of variance (MANOVAs) conducted with the original 5-point frequency scale. These MANOVAs included duty position (leader and nonleader) and company as between-subject factors. The set of dependent variables used in each MANOVA are cited below. [For each analysis, all individuals had to have data on each variable.]

Viewed SA display and manipulated map
Sent CFF, CFM, SALUTE and free text
Received CFF, CFM, SALUTE and free text
Used voice communications, used DVS to engage targets, and viewed digital images
Received overlays and received orders.

Another MANOVA was conducted comparing the three companies on the four leader planning functions of creating and modifying orders and creating and modifying overlays.

Use of primary functions. Table 21 shows the use of two map-related functions by company (leader and nonleaders combined) and by duty position (across all companies). Several trends are evident. Over all, the map displays (digitized/satellite views) as well as the SA display were used frequently (typically by 60% or more of those surveyed). Leaders used both functions more frequently than nonleaders (statistically significant). Map and SA usage showed significant differences among companies (leaders and nonleaders combined), with T Company having significantly higher usage frequencies on both functions than R Company. In addition, for the SA display, T Company frequencies were higher than S Company. [6]

Table 21
Use of Map-related Functions

Map Function	**% of Individuals Indicating Use of LW Function**					**Description of Significant Differences**
	Company			**Duty Position**		
	R	T	S	L	NL	
Viewed SA Display	48	70	56	71	44	L higher than NL T Co higher than R & S
Manipulated Map	54	77	70	73	61	L higher than NL T Co higher than R

Note. "NL" indicates nonleaders; "L" indicates leaders.

Table 22 shows the use of messages by company and by leaders and nonleaders within each company. The trends in this table are as follows. In general, SALUTE and free text were more likely to be sent and received than CFF and CFM, typically by 30% or more individuals for SALUTE and free text compared to less than 20% for CFF and CFM. Leaders were more likely to send and receive SALUTE messages than nonleaders (statistically significant). There were no other significant differences between leaders and nonleaders on message use.

In general, R Company had the lowest rates for sending and receiving messages, as indicated by the following significant differences among the companies. For sending messages, T Company was more likely to send CFM messages than R and S Companies; T Company was also more likely to send SALUTE messages than R Company. For receiving messages, T Company had significantly higher usage rates on each type of message than R Company, and it was higher than S Company on receiving CFF and CFM messages. Lastly, S Company was more likely to receive SALUTE and free text messages than R Company.

[6] The significant differences cited in this section are based on the MANOVAs which used the original 5-point frequency scale, rather than the percentage of individuals who indicated they used a function "sometimes," "frequently," or "always." The MANOVA results are affected by the distribution of responses across the entire 5-point scale, which also included the categories of "never used" and "frequently used."

Table 22
Use of Messages

Message Function	% of Individuals Indicating Use of LW Function					Description of Significant Differences
	Company			Duty Position		
	R	T	S	L	NL	
Sent CFF	9	13	13	13	7	---
Sent CFM	17	35	25	30	20	T Co higher than R & S
Sent SALUTE	16	28	40	41	15	L higher than NL T Co higher than R
Sent Free Text	39	50	58	57	40	---
Received CFF	7	18	12	14	10	T Co higher than R & S
Received CFM	16	35	32	35	19	T Co higher than R & S
Received SALUTE	13	43	45	48	18	L higher than NL T & S Co higher than R
Received Free Text	37	61	65	61	46	T & S Co higher than R

Note. "NL" indicates nonleaders; "L" indicates leaders.

Table 23 shows usage of the voice function, weapon subsystem capabilities (using DVS to detect and engage targets), and the capability of pulling up pre-loaded and stored digitized images. For voice communications, DVS usage, and viewing of digital imagery, the usage percentages had a distinct pattern. Voice communications were very common (used by over 65%). The viewing of digital images was less common. However, for both functions, leader usage was significantly higher than nonleader usage. Also, R and S Company usage rates were higher than T Company on each of these functions. The other general trend was the low use of the DVS, less than 20%. In fact, there were no significant differences between leaders and nonleaders, nor among companies on DVS usage.

Table 23
Use of Voice Communications, Weapon Subsystem, and Digital Images

Voice, DVS and Digitized Image	% of Individuals Indicating Use of LW Function					Description of Significant Differences
	Company			Duty Position		
	R	T	S	L	NL	
Used Voice Communications	67	81	81	84	69	L higher than NL T & S Co higher than R
Viewed Digital Images	26	50	46	53	28	L higher than NL T & S Co higher than R
Used DVS to detect & engage targets	13	14	20	15	15	---

Note. "NL" indicates nonleaders; "L" indicates leaders.

Use of planning functions. The next tables (Table 24 and 25) summarize use of the LW planning functions, specifically orders and overlays. Both nonleaders and leaders were asked

whether they reviewed and viewed overlays and orders. However, questions regarding the creation and modification of orders and overlays were asked only of leaders (i.e., in the leader survey).

In general, for the two major functions of receiving orders and overlays, usage frequencies were typically higher for receipt of overlays than orders. For each function, leader frequencies were significantly higher than nonleader frequencies. For each function, T Company frequencies were higher than other two Companies, and S Company frequencies were higher than R Company.

Table 24
Use of Planning Functions Available to Leaders and Nonleaders

Planning Function	**% of Individuals Indicating Use of LW Function**					**Description of Significant Differences**
	Company			**Duty Position**		
	R	T	S	L	NL	
Received/Viewed Overlays	31	71	58	71	35	L higher than NL T Co higher than R & S S Co higher than R
Received/Viewed Orders	24	63	49	56	34	L higher than NL T Co higher than R & S S Co higher than R
Received WARNO	18	41	30	35	24	
Received OPORD	22	62	46	49	37	Descriptive statistics only
Received FRAGO	38	25	15	38	25	

Note. "NL" indicates nonleaders; "L" indicates leaders.

As indicated in Table 25, orders were created and/or modified by a low percentage of the leaders, less than 20% for the companies. The percentages for overlays were generally higher than for orders. A MANOVA was conducted on these four functions, and there were no significant differences among the three companies. No statistical analyses were conducted on the specific types of orders and overlays. Results in Table 25 indicated that few leaders were involved in creating and/or modifying a specific type of order and/or overlay. In general, the operations and enemy overlays were the most commonly created and modified overlays.

Of additional interest were the leader duty positions involved in creating and modifying orders and overlays, as the answer to this question could impact the optimum NET POI regarding training on LW planning functions. The following duty positions (refer to Table 20 for definitions) were examined: Company Commander, Company Executive Officer, First Sergeant, Platoon Leader, Platoon Sergeant, Squad Leader, Team Leader, Engineer Platoon Leaders (including platoon sergeant), Engineer Squad Leaders, Recon Platoon Leaders (including platoon sergeant), and Recon Team Leaders. It was not expected that every leader would create an order or overlay. However, it was expected that more leaders might modify an order or an overlay.

Table 25
Use of Planning Functions – Leaders only

Planning Function	% of Leaders Indicating Use of LW Function			Description of Significant Differences
	Company			
	R	T	S	
Created Overlays	21	29	36	No differences on any function
Modified Overlays	17	26	24	
Created Orders	7	9	20	
Modified Orders	10	9	23	
Created WARNO, OPORD or FRAGO[a]	5-7	6-9	8-15	Descriptive statistics only
Modified WARNO, OPORD or FRAGO[a]	2-7	9-12	12-16	
Created Operations Overlay	16	21	23	
Created Enemy Overlay	16	29	42	
Created Fire Support Overlay	9	9	15	
Created Obstacle Overlay	9	9	27	
Created CSS Overlay	7	3	8	
Modified Operations Overlay	14	30	15	
Modified Enemy Overlay	5	33	23	
Modified FS Overlay	2	9	16	
Modified Obstacle Overlay	7	12	12	
Modified CSS Overlay	2	9	4	

Note. NL" indicates nonleaders; "L" indicates leaders.
[a] Percentage of leaders who created or modified each type of order for each company was between 0 and 19%.

For the company positions (commander, executive officer, and first sergeant), the executive officer was most likely to work with both orders and overlays. It appears that the company commanders tended to delegate this responsibility to the executive officers. With regard to orders, one executive officer indicated he always created orders; one indicated he sometimes generated them, and the third indicated he did not work with orders. All three executive officers indicated they generated/modified overlays, specifically the operations and enemy overlays. One also generated/modified the fire support and obstacle overlays. One of the three company commanders indicated that he sometimes generated/modified orders. Typically two of the company commanders indicated they generated overlays. Only two first sergeants completed the survey; neither created/modified orders. One indicated he created/modified overlays.

At the rifle platoon level, eight platoon leaders and eight platoon sergeants completed the survey. With regard to orders, two to three platoon leaders indicated they sometimes created or modified an order (WARNO, OPORD, or FRAGO); while the platoon sergeants did not create/modify orders. Only half of the platoon leaders and only two platoon sergeants indicated they generated or modified overlays, specifically operations and enemy overlays.

Typically, 5% to 10% of the squad leaders (n = 32) were involved with creating or modifying orders, while 25% of the squad leaders were involved with creating or modifying overlays. For team leaders (n = 26), 11% modified or created orders; 15% created or modified overlays. Of interest is that every squad leader and team leader who indicated he frequently worked with orders, also created/modified overlays.

The number of leader positions examined within other Battalion elements such as the Engineer Company and Recon Platoon was small (total of 11). However typically, both the engineer platoon leader and platoon sergeant, generated overlays, to include the obstacle overlay. They also indicated they modified the operations and enemy overlays; one indicated he modified the combat service support overlay. They did not create orders, but indicated they modified them. Two of the three engineer squad leaders indicated they modified overlays, but they did not create or modify orders. One of the two recon platoon leaders indicated he created an enemy and obstacle overlay. This individual also reported he modified orders, but did not generate orders. Typically three of the four recon team leaders indicated they created and modified operations, enemy, and obstacle overlays. However, none created or modified orders.

As expected, involvement with the planning process decreased at the lower echelons. Of interest, however, was the difference in the use of planning tools at the platoon level within the rifle platoons, the engineer platoon, and the recon platoon, with the rifle platoon leaders not as involved in planning processes as the engineer and recon platoon leaders.

Lastly, it is important to note which of these leaders indicated they used the MDSE relatively frequently (see Table 26 in the next section). All company leaders (commander, executive officer and first sergeant) except one first sergeant indicated they used the MDSE. Six of the seven rifle platoon leaders had used the MDSE, but no platoon sergeant used it. Only three squad leaders and three fire team leaders indicated MDSE use. Some engineer and reconnaissance leaders indicated use as well. Records of who attended the MDSE training were not available, so it is not known whether the usage reports on the survey corresponded to formal NET training or informal training by a peer or leader. Nor can any direct associations be made between MDSE use and use of LW planning features. However, for the rifle platoon leaders, the numbers of leader using the MDSE were larger than the numbers indicating use of LW planning features – orders and overlays. On the other hand, for the engineer and reconnaissance elements, more of these leaders indicated using LW planning features than using the MDSE. Clearly for at least some of these leaders, their use of the LW planning features (overlays primarily) was distinct from the MDSE, in that orders and overlays can be created and modified directly on the LW system software.

Other leader specific functions. Leaders were asked about their use of four additional leader-specific functions and capabilities. These were: using the HMD to view TWS images, using the HMD to view/send target information from the STORM, loading a MDP, and creating orders and overlays on the MDSE. MDSE use has already been discussed.

Several factors impact the usage percentages for these functions. Not all leaders at the team leader level and above had access to these items of equipment, nor are all the tasks a

responsibility of all leaders. For example, the Stryker Battalion had limited numbers of the TWS and STORM. The Army basis of issue plan for the TWS is to issue it primarily to squad and fire team leaders. However, unit SOP also could have affected who received the TWS and STORM. In addition, the unit could have had different leaders use this equipment as they determined how to best employ the LW system during their unit training. Similarly, the person responsible for loading a MDP could depend on the SOP developed by the unit. With respect to using the MDSE, it was anticipated that platoon leaders and above would use this equipment for mission planning. Nevertheless, the unit could have designated others as responsible for planning with the MDSE.

Because of these factors, it was not appropriate to tabulate an overall percentage of leaders who used these functions. Table 26 presents descriptive statistics on the percentage of individuals in each leader position who used these functions. These percentages indicate differing patterns of use depending on the duty position and the function.

Table 26
Use of Leader-Specific Functions by Duty Position

Leader Position	***N* in**	**% Leaders Using Each Function**			
	Survey[a]	TWS	STORM	MDP	MDSE
Co Cdr	3	0 (0%)	0 (0%)	3 (100%)	3 (100%)
1SGT	2	0 (0%)	0 (0%)	2 (100%)	1 (50%)
Co XO	3	0 (0%)	0 (0%)	2 (67%)	3 (100%)
Co FS NCO	3	0 (0%)	0 (0%)	1 (33%)	1 (33%)
Plt Ldr	7	0 (0%)	2 (28%)	5 (71%)	6 (86%)
PSG	8	1 (13%)	2 (25%)	4 (50%)	0 (0%)
SL	32	8 (25%)	3 (9%)	11 (34%)	3 (9%)
TL	30	8 (27%)	3 (10%)	5 (17%)	3 (10%)
Eng Plt Ldr	2	0 (0%)	0 (0%)	1 (50%)	1 (50%)
Eng Sqd Ldr	3	2 (67%)	2 (67%)	1 (33%)	0 (0%)
Recon Plt Ldr	2	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Recon Sqd Ldr	4	0 (0%)	3 (75%)	3 (75%)	2 (50%)
FO	5	2 (40%)	2 (40%)	1 (20%)	0 (0%)

Note. The percentages are the percentage of leaders who reported they used the function "sometimes," "frequently," or "always." The single sniper indicated use of all 4 functions.
[a] Numbers in each duty position correspond to the data in Table 20 which shows the number of individuals who responded to the consolidated survey by duty position.

Lower-echelon leaders typically used the TWS and STORM. In particular, squad and team leaders primarily used the TWS, although some engineer squad leaders and forward observers also used it. On the other hand, leaders in more duty positions used the STORM, and its use was not concentrated in any duty position. Some platoon leaders and platoon sergeants used the STORM, but fewer squad and team leaders used the STORM compared to the TWS.

The two functions of loading a MDP and using the MDSE were more likely to be performed at the platoon echelon and above. For MDP use, the major exception to this statement

is that about one-third of the squad leaders also performed this task. For MDSE use, the major exception to this statement is that none of the platoon sergeants indicated use of the MDSE. It is noted the company commanders and executive officers used the MDSE and loaded MDPs.

Usage summary. Table 27 summarizes and integrates the percentages of nonleaders and leaders who used the functions addressed in both the leader and nonleader surveys, as well as creating and modifying orders and overlays which were leader-specific functions. The results are ordered from high to low frequency of use. Specific types of orders and overlays are not included in the summary table. The percentages are consistent with the prior tables in this section.

Table 27
Percentages of Nonleaders and Leaders who Used Each LW Function (ordered from high to low)

% Individuals Using Function	**Leaders**	**Nonleaders**
High % - Above 80%	--Voice communications (84)	
70 to 79%	--Manipulated map (73) --Viewed SA display (71) --Received overlays (71)	
60 to 69%	--Received free text (61)	--Voice communications (69) --Manipulated map (61)
50 to 59%	--Sent free text (57) --Received orders (56) --Viewed digital images (53)	
40 to 49%	--Received SALUTE (48) --Sent SALUTE (41)	--Received free text (46) --Viewed SA display (44) --Sent free text (40)
30 to 39%	--Received CFM (35) --Sent CFM (30)	--Received overlays (35) --Received orders (34)
20 to 29%	--Created overlays** (29) --Modified overlays ** (22)	--Viewed digital images (28) --Sent CFM (20)
10 to 19%	--Used DVS (15) --Received CFF (14) --Modified orders** (14) --Sent CFF (13) --Created orders** (12)	--Received CFM (19) --Received SALUTE (18) --Sent SALUTE (15) --Used DVS (15) --Received CFF (10)
Less than 10%		--Sent CFF (7)

** Leader task only

The table indicates relatively high agreement between nonleaders and leaders regarding the most frequently used functions. The top eight functions for nonleaders (voice communications, manipulate map, receive free text, view SA display, sent free text, received overlays, received orders, viewed digital images) were also in the top eight functions for leaders.

However, more leaders used these functions than nonleaders. In addition, there was some agreement regarding the infrequently used functions. Common to both leaders and nonleaders was the low use of the DVS, and sending and receiving CFF messages. There was less consistency in the ordering of the other functions which were used at more moderate rates.

Figure 9 is a graphic representation of these data, which groups the functions to illustrate patterns. For example, receiving and sending the four types of messages are grouped together. The relatively frequent use of free text by both groups is shown, as well as the tendency for leaders to use SALUTE. It is not known why the CFM message was relatively common for leaders, unless they experimented with this message during their unit training exercises. The significant differences between leader and nonleader percentages on receiving orders and viewing images are also evident in Figure 9.

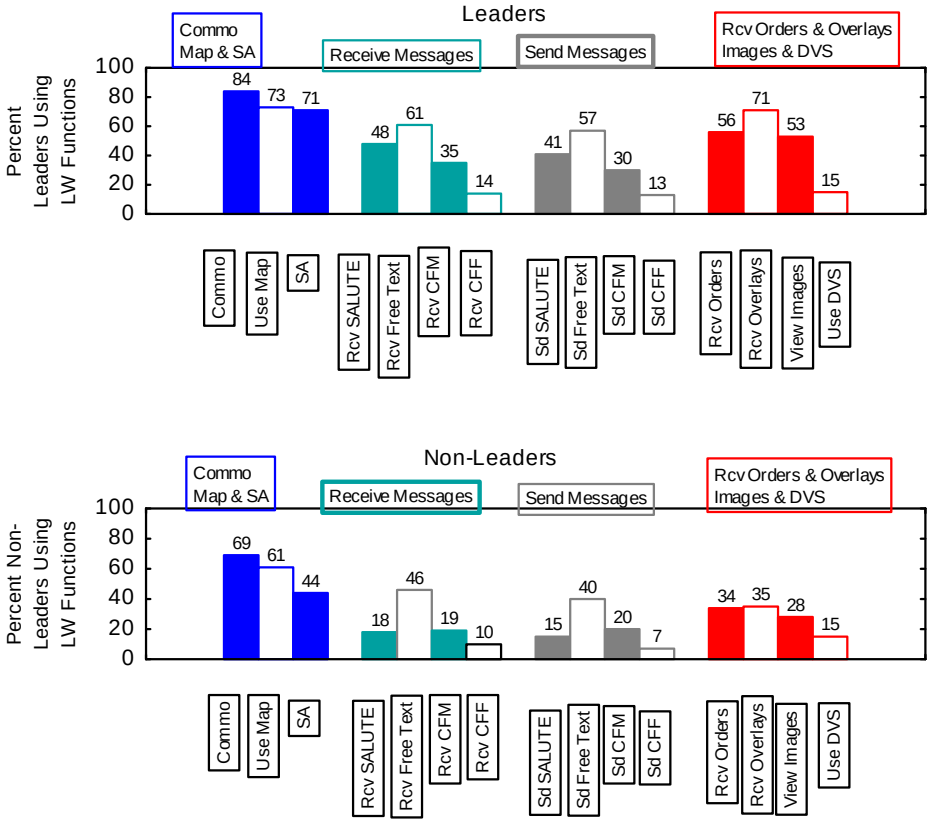


Figure 9. Percentage of leaders and nonleaders using basic LW functions.

The analysis of the leader specific functions showed that, in general, leaders performed LW-related functions in accordance with their duty positions. However, it is not known whether the

usage profiles will be typical of future use as leaders become more proficient or whether use of some functions depend on the mission.

Proficiency in Performing LW Tasks and Functions (Section III on Training Implications, Question 1 of the Survey)

Soldiers were queried regarding their proficiency or confidence in performing a sample of 17 LW tasks/functions. They indicated the point in training when they felt proficient on each task/function. The phases of training, in sequence, were: NET, squad integration training, squad live fire exercises (LFXs), platoon LFXs, Company situational training exercises (STXs) or the Limited User Test, and the CALFEX. Two other options were presented. Individuals could mark "Never felt proficient," or "No basis to judge." The time period between the end of NET and the CALFEX was approximately four months.

Everyone was asked about their proficiency with the following 17 tasks/skills.

1. Easily controlling the cursor on the SCU
2. Voice Communications (use of call groups using the SCU and WUID)
3. Configuring message settings (e-mail type functions)
4. Creating and sending SALUTE
5. Creating and sending CFF messages
6. Sending and canceling the CFM message
7. Basic map operations (zoom, pan, select maps)
8. Using the measure tool
9. Plotting and moving symbols such as waypoints and checkpoints
10. Using overlays sent to them (applying to map, turn on and off)
11. Changing SA settings
12. Troubleshooting the system (check battery, the network, GPS status)
13. Zeroing the DVS
14. Detecting targets with the DVS from reduced exposure position
15. Hitting targets at greater than 150m with DVS from reduced exposure position
16. Hitting targets at greater than 150m with DVS from indirect view position
17. Using the HMD to navigate at night, without looking at it constantly

Leaders who had the TWS were also asked to indicate their proficiency in hitting targets with the TWS from reduced exposure and indirect view firing positions.

The LW functions addressed in the proficiency questions overlapped with, but were not identical to, the functions addressed in the frequency of use questions, allowing some associations to be made between the two sets of question. One area not covered in the proficiency questions was proficiency with orders. The proficiency questions tended to be more precise than the usage questions in order to more clearly specify what was meant by "proficiency." For example, the marksmanship questions specified the distance at which individuals could hit targets. Examples of troubleshooting procedures were given. Basic map operations were defined.

Overall LW proficiency trends. Results on three general questions regarding proficiency are presented first to provide an overall picture of nonleader and leader perceptions. Then information is presented on the 17 specific tasks and skills.

Everyone was asked about their overall proficiency to operate the LW system as a function of the phase of their training. These results are shown in Figure 10 for the nonleaders and leaders within each company. Several trends are evident in this graph.

The first trend is that everyone did not indicate they were proficient at the end of NET. For example, the percentages of nonleaders who indicated proficiency ranged from 45% to 54%; 31% to 49% of leaders indicated proficiency at the end of NET.

The second trend is that at the end of the unit training (CALFEX), as shown in Figure 10, the percentage of leaders perceiving themselves as proficient was higher than the corresponding percentage of nonleaders. Almost all the T Company leaders (97%) felt they were proficient. The lowest percentage was the nonleaders within R Company, with only 65% indicating they were proficient at the end of unit training.

The third trend was the gradual increase in perceived proficiency over time by all groups except for two groups of leaders. The T Company leaders' percentages increased substantially at LUT. The percentage of these leaders who indicated proficiency changed from 69% at the end of platoon LFX to 92% at the end of LUT. It is important to mention that only this company participated in the LUT, and only individuals at the team leader level and above within this Company used the LW equipment during LUT. The other exception to this gradual increase in perceived proficiency is reflected in S Company leaders after the CALFEX (the percentage of leaders indicating proficiency went from 58% after the Company STX to 85% after the CALFEX).

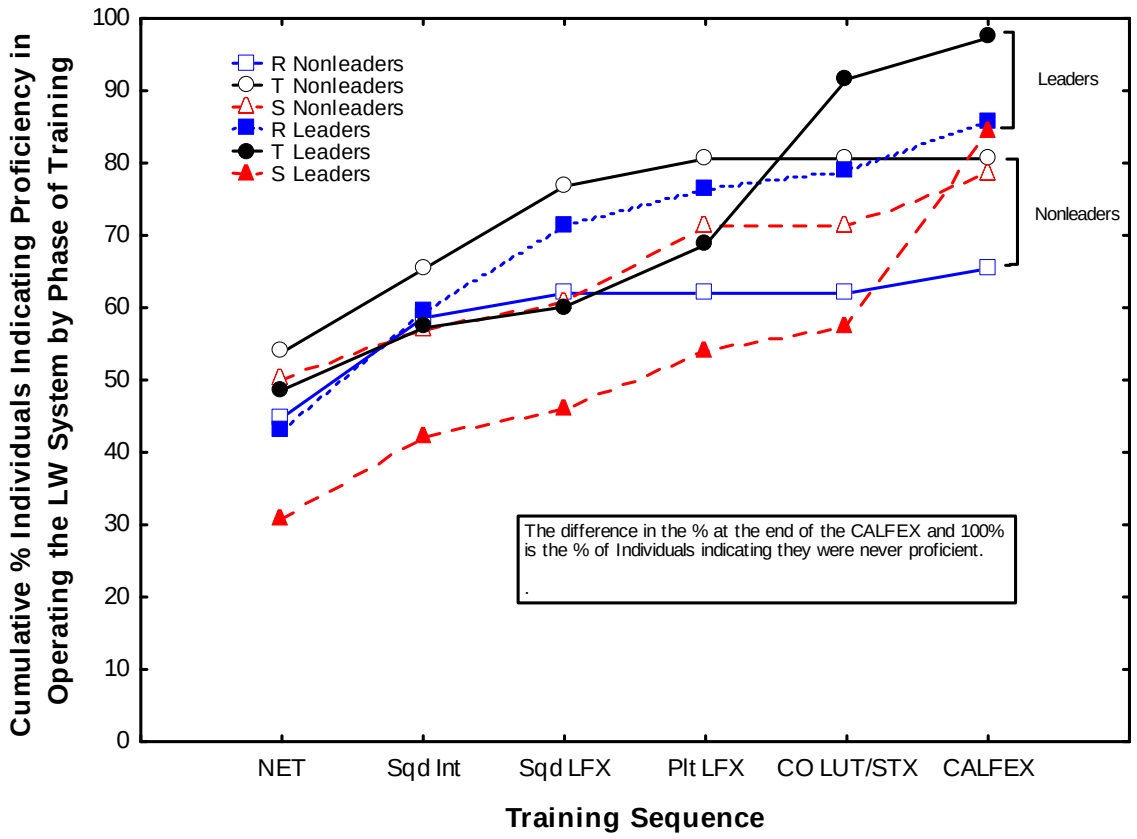


Figure 10. Cumulative percentage of individuals indicating proficiency with their overall ability to operate the LW system as a function of training phase (NET was the first phase; CALFEX was the last phase).

Leaders only were asked two more general questions. They identified the point in training when they were confident in the individual LW skills possessed by those within their unit and also when they were confident in their unit's ability to effectively employ LW capabilities. These results are in Figure 11 for leaders within each company. Several trends are evident in this graph.

The first trend is that the leaders' ratings regarding proficiency achieved at the end of NET for individual skills were lower than the self-perceptions of individual skills shown in Figure 10. The percentage of leaders indicating confidence in the individual skills of those within their units ranged from 17% to 32%. Confidence in unit employment skills at the end of NET were at a similar level, with 13% to 29% of the leaders indicating confidence.

The second trend was a gradual increase in the leaders' confidence in individual skills and in their unit's ability to employ the LW system over time. The exception to this gradual increase was T Company. Here the percentage of leaders who had confidence in these two dimensions increased from 59% to 91% for individual skills and from 52% to 86% for unit employment from the end of the platoon LFX to the end of the LUT. The percentage of T company leaders indicating confidence at the end of unit training (CALFEX) was 91% for both dimensions. On the other hand, the percentage of leaders from the other companies who indicated confidence on both dimensions at the end of training was lower, ranging from 60% to 75%.

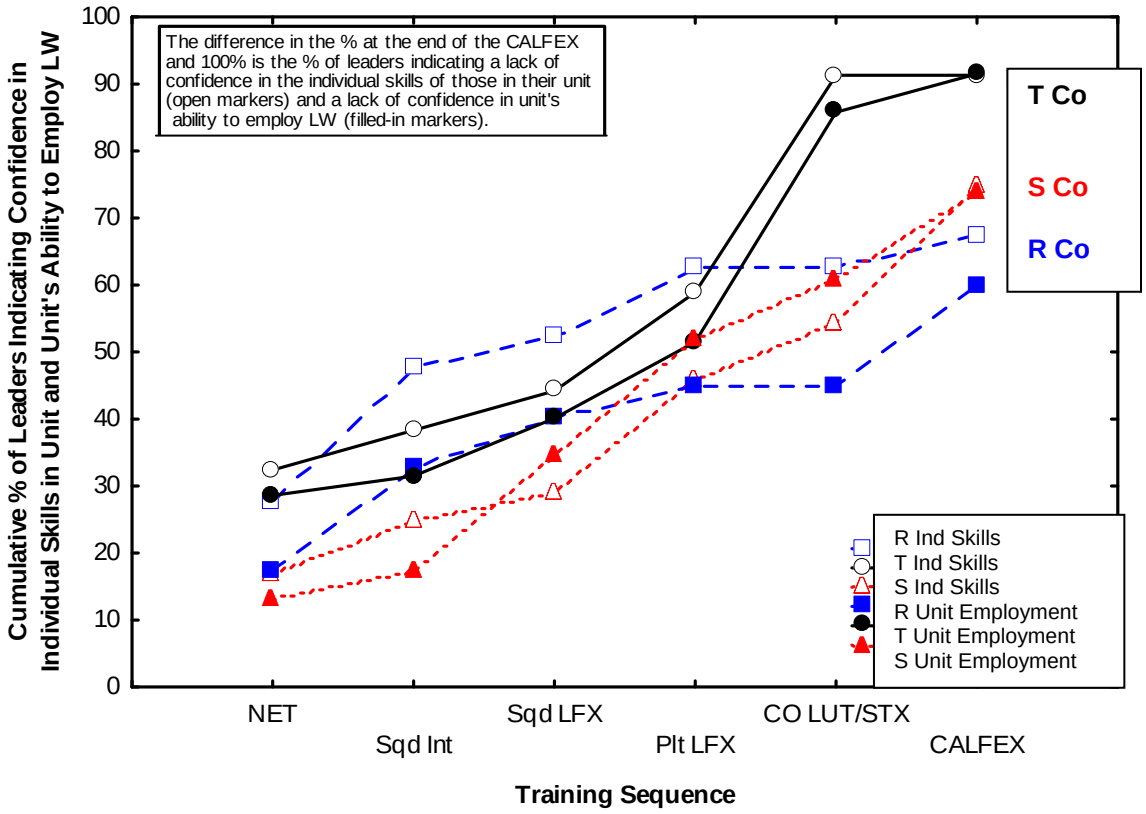


Figure 11. Cumulative percentage of leaders with confidence in the individual LW skills in their unit and in their unit's ability to effectively employ the LW system as a function of training phase (NET was the first phase; CALFEX was the last phase).

Figures 10 and 11 graphically show the trends over time in perceived proficiency. In order to conduct statistical analyses and to identify major trends, the training sequence responses were collapsed into three categories: never achieved proficiency, achieved proficiency in NET, and achieved proficiency in unit training (regardless of the phase or type of unit training). Numerical codes used for these three categories were 1, 2, and 3. These codes reflected both degree of proficiency and time when proficiency was achieved.

For the question on overall ability to operate the LW system, a 3 x 2 (company by leader/nonleader) analysis of variance (ANOVA) was conducted on the proficiency codes. The leader/nonleader factor was significant; there were no other significant effects. A follow-on Chi-square analysis was conducted comparing the distribution of leader and nonleader percentages on proficiency. The Chi-square was significant. As indicated in Table 28, more nonleaders than leaders indicated they were never proficient or became proficient in NET, and more leaders became proficient in unit training.

Table 28
Indices of Proficiency with the LW System

Question		**Percentage Individuals Indicating Proficiency**			**Description of Significant Differences[a]**
		Never	Proficient in NET	Proficient in Unit Training	
Overall ability to operate LW	L	11	41	40	More NL than L never proficient & proficient in NET and more L proficient in unit training
	NL	23	52	24	
Leaders' Perception of Individual and Unit Skills					
Individual skills within Unit	R Co	33	28	40	No company differences
	T Co	9	32	59	
	S Co	25	17	58	
Unit's ability to employ LW	R Co	40	18	43	More T Co leaders likely to say unit never proficient & fewer indicated unit was proficient in unit training, compared to T Co leaders.
	T Co	9	29	63	More T & S Co leaders likely to indicate their unit became proficient in unit training.
	S Co	26	13	61	Fewer T Co leaders indicated their unit was never proficient.

Note. "L" represents leaders; "NL" represents nonleaders
[a] Significant differences based on Chi-square analyses.

The two leader questions on the individual skills within their unit and their unit's ability to employ LW were initially examined with a MANOVA comparing the three companies. Chi-square analyses were then conducted on the company percentages when there was a significant difference. A significant effect occurred on the unit employment question, with more R Company leaders indicating their unit was not proficient compared to T Company leaders, and more T Company leaders indicating their unit became proficient during unit training and few T Co leaders indicating their unit was never proficient (see Table 28).

Proficiency trends for specific functions and tasks. This section presents details on the 17 LW functions/tasks that everyone rated. As with the general questions on proficiency, survey participants indicated the phase of training where they were proficient (NET, various phases of unit training, and never proficient). In this section, all the unit training responses were again collapsed into one category, yielding the three proficiency categories of proficient in NET, proficient in unit training, and never proficient. The analytic approach was as follows. MANOVAs were conducted on the proficiency data for similar tasks/functions (e.g., marksmanship, messages) using the factors of leader/nonleader and company. As the only significant effect was duty position, Chi-square analyses were then conducted to determine how the proficiency percentages were distributed across the leader and nonleader positions.

Tables 29 through 32 summarize the results on the 17 tasks. Table 29 presents the results on message functions. For each of the four message functions, the MANOVA showed a significant difference for duty position. In each case, more nonleaders than leaders were likely to indicate they were not proficient on messages, while more leaders indicated they became proficient during unit training. Note that Table 29 shows that from 19% to 42% of the nonleaders stated they were never proficient compared to 4% to 16% of the leaders. On the other hand, 27% to 30% of the leaders indicated they became proficient in unit training, while only 8% to 14% of nonleaders indicated they gained proficiency during unit training.

Table 29
Proficiency With Message Functions

Message Functions	**% of Individuals Indicating Proficiency with the LW Function**						**Description of Significant Differences**
	Never		NET		Unit		
	L	NL	L	NL	L	NL	
Configure Messages	4	19	67	67	30	14	More NL never proficient and more L proficient in unit training
Create/Send SALUTE	14	36	56	56	30	8	
Create/Send CFF	16	42	55	47	29	12	
Send/Cancel CFM	4	21	69	70	27	10	

Note. "L" indicates leaders; "NL" indicates nonleaders.

Table 30 presents the results on map-related functions. For basic map operations, changing SA settings, and using the measure tool, the differences between leaders and nonleaders corresponded to the same pattern that occurred with the message functions. This was also the case for plotting symbols but in addition, more nonleaders indicated they gained this skill in NET as well.

Table 30
Proficiency With Map-related Functions

Map-related Functions	% of Individuals Indicating Proficiency with the LW Function						Description of Significant Differences
	Never		NET		Unit		
	L	NL	L	NL	L	NL	
Map Operations	6	16	72	71	22	13	More NL never proficient and more L proficient in unit training
Change SA Settings	10	24	57	60	33	15	
Use Measure Tool	9	21	64	67	28	13	
Plot Basic Symbols	16	25	51	63	33	12	More NL never proficient and proficient in NET, and more L proficient in unit training

Note. "L" indicates leaders; "NL" indicates nonleaders.

Table 31 presents the marksmanship proficiency results. In this case there was no difference between leaders and nonleaders, but the table is presented to document the distribution of responses. The highest percentage of "never proficient" ratings occurred for both leaders and nonleaders on the marksmanship skills (ranging from 21% to 39% for leaders and from 35% to 46% for nonleaders). In addition, the percentage of Soldiers indicating that NET led to proficiency on these tasks was low.

Table 31
Proficiency With Marksmanship Skills

Marksmanship Functions	% of Individuals Indicating Proficiency with the LW Function						Description of Significant Differences
	Never		NET		Unit		
	L	NL	L	NL	L	NL	
Zero the DVS	21	35	45	42	34	23	No Differences
Detect Targets REF	33	39	40	45	27	16	
Hit Targets REF	39	46	35	40	25	14	
Hit Targets Indirect View	35	42	41	44	25	14	

Note. "L" indicates leaders; "NL" indicates nonleaders. "REF" indicates reduced exposure fire.

Table 32 presents five other LW functions. Three functions (voice/call groups, control SCU, and use of HMD for night land navigation) showed the same differences between leaders and nonleaders as was the case for messages. With basic use of overlays and troubleshooting, more nonleaders were likely to indicate gaining proficiency in NET. In addition, there was a significant company effect for use of overlays, where T and S Companies indicated a higher degree of proficiency than S Company.

Table 32
Proficiency With Other LW Functions

Function	% of Individuals Indicating Proficiency with the LW Function						Description of Significant Differences
	Never		NET		Unit		
	L	NL	L	NL	L	NL	
Use Voice/Call Groups	5	23	67	63	28	14	More NL never proficient
Control SCU	4	19	72	67	24	14	And more L proficient
Use HMD for Night Nav	17	40	39	41	44	19	in unit training
Use Overlays	16	27	43	60	41	13	More NL never proficient and proficient in NET;
Troubleshoot	15	23	40	57	45	21	more L proficient in unit training

Note. "L" indicates leaders; "NL" indicates nonleaders.

NET results. For each task, the percentage of leaders and nonleaders indicating they were proficient in NET was divided into 10% increment brackets. Table 33 presents the tasks and functions ordered from high to low for leader and nonleaders.

Table 33
Percentage of Leaders and Nonleaders Indicating Proficiency on LW Tasks/Functions in NET

% Indicating "Felt Proficient" in NET	Leaders	Nonleaders
70 to 79% *(High)*	• Map operations (72) • Control SCU (72)	• Map operations (71) • Send/cancel CFM (70)
61 to 69%	• Send/cancel CFM (69) • Configure messages (67) • Use voice/call groups (67) • Use measure tool (64)	• Configure messages (67) • Use measure tool (67) • Control SCU (67) • Plot basic symbols (63) • Use voice/call groups (63) • Change SA settings (60) • Use overlays (60)
50 to 59%	• Change SA settings (57) • Create/send SALUTE (56) • Create/send CFF (55) • Plot basic symbols (51)	• Troubleshoot (57) • Create/send SALUTE (56)
40 to 49%	• Zero the DVS (45) • Use overlays (43) • Hit targets indirect view (41) • Detect targets REF (40) • Troubleshoot (40)	• Create/send CFF (47) • Detect targets REF (45) • Hit targets indirect view (44) • Zero the DVS (42) • Use HMD for night navigation (41) • Hit targets REF (40)
Less than 40% *(Low)*	• Use HMD for night navigation(39) • Hit targets REF (35)	

Note. Percentages based on the percentages in Tables 29-32.

Across all tasks the percentages of nonleaders and leaders who indicated they were proficient in NET were relatively similar (ranging from 40% to 70% for each group, see Table 33). However, more nonleaders were apt to say they gained their proficiency in NET than were leaders. NET was perceived by leaders and nonleaders as being the most successful on the following tasks: Map operations, control of SCU, CFM, configuration of messages, voice/call groups, and use of the measurement tool. NET was perceived as being least successful on use of the HMD for night navigation and hitting targets via reduced exposure firing techniques. These low proficiency ratings are consistent with the execution of NET. As indicated in the section on the NET training observations, there was no night operations training in NET and reduced exposure firing was only familiarization, no performance standard was required of the Soldiers.

The correlation between nonleader and leader percentages on the tasks trained during NET was examined. It was high and significant, $r = .79$, $p < .001$, indicating that both groups agreed on which tasks were trained the best in NET and which were not trained as well, that is, the ordering of the tasks. However, the absolute percentages for the two groups differed somewhat. Figure 12 shows that the agreement between nonleaders and leaders was strongest for the tasks they both perceived as being trained well in NET, and those they perceived as being trained the most poorly in NET (e.g., marksmanship tasks). There was less agreement on tasks that fell between these two extremes, e.g., troubleshooting, overlays. The percentages for leaders and nonleaders used for this correlation were the means of the company percentages.

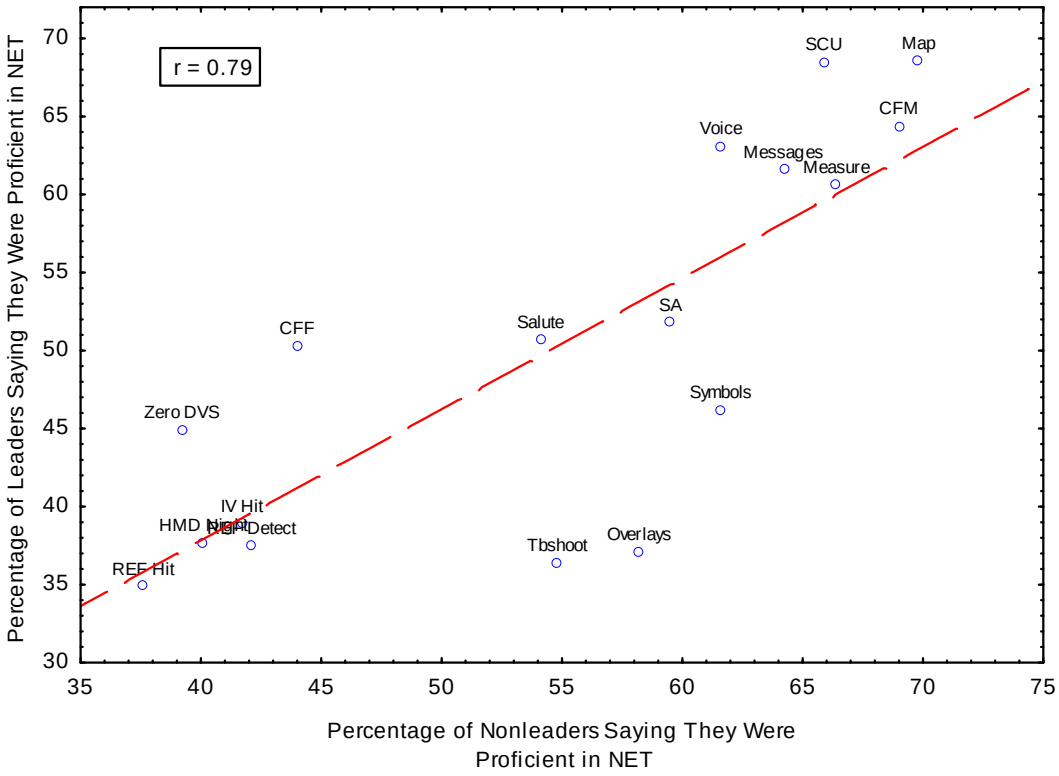


Figure 12. Correlation between tasks: NET proficiency percentages for nonleaders and leaders.

Unit training results. Table 34 shows the ordering of the functions and tasks with regard to unit training. The table clearly shows that leaders indicated they gained proficiency in unit training on many tasks, whereas that was not the case for nonleaders. Recall that the leader frequency of using LW functions in unit training was typically more than nonleader usage. One of the reasons for the proficiency discrepancy could simply reflect the higher usage in unit training by leaders, which in turn led to higher proficiency.

Table 34
Percentage of Leaders and Nonleaders Indicating Proficiency on LW Tasks/Skills in Unit Training (ordered from high to low)

% Indicating"Felt Proficient" in Unit Training	**Leaders**	**Nonleaders**
40 to 49% *High*	• Troubleshoot (45) • Use HMD for night navigation(44) • Use overlays (41)	
30 to 39%	• Zero the DVS (34) • Plot basic symbols (33) • Change SA settings (33) • Create/send SALUTE (30) • Configure messages (30)	
20 to 29%	• Create/send CFF (29) • Use measure tool (28) • Use voice/call groups (28) • Detect targets REF (27) • Send/cancel CFM (27) • Hit targets indirect view (25) • Hit targets REF (25) • Control SCU (24) • Map operations (22)	• Zero the DVS (23) • Troubleshoot (21)
10% to 19%		• Use HMD for night navigation (19) • Detect targets REF (16) • Change SA settings (15) • Use voice/call groups (14) • Control SCU (14) • Configure messages (14) • Hit targets REF (14) • Hit targets indirect view (14) • Use measure tool (13) • Use overlays (13) • Map operations (13) • Plot basic symbols (12) • Create/send CFF (12) • Send/cancel CFM (10)
Less than 10%		• Create/send SALUTE (8)

Note. Percentages based on the percentages in Tables 29-32.

There was little relationship between nonleaders and leaders on the ordering of the 17 tasks with respect to unit training. The correlation was r = .31, not significant. Figure 13 shows this correlation. Two tasks are used to illustrate why this correlation was not high. As shown in the graph, for nonleaders proficiency with the measure tool was one of the top tasks perceived as being trained in unit exercises, while it was ranked lower by leaders. For overlays, the opposite pattern occurred. For leaders, this was one of the three top tasks where unit training helped them gain proficiency, whereas for nonleaders use of overlays was in the bottom half of the task order. Task percentages for leaders and nonleaders were based on the mean of the company percentages.

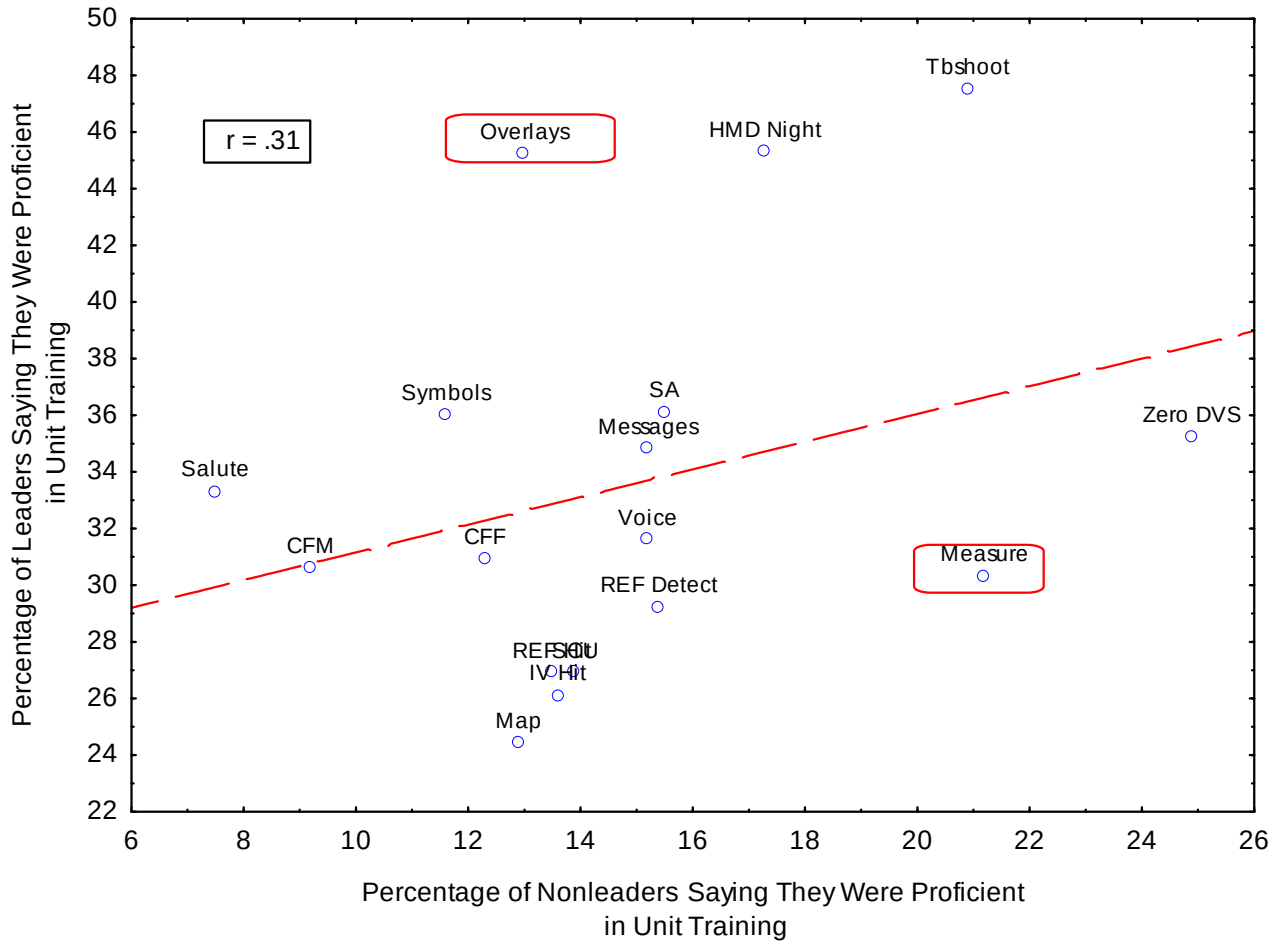


Figure 13. Correlation between tasks: Unit proficiency percentages for nonleaders and leaders.

Never proficient results. The percentage of individuals who indicated they were not proficient at the end of all training on each of the LW tasks is presented in Table 35. Obviously, the never category was marked if they felt they had not achieved proficiency in NET or in any of the unit training. Consequently the "never proficient" results are dependent on the NET and unit responses. For leaders, there was a set of five tasks for which approximately 20-30% felt they

were not proficient. These included all the marksmanship tasks. Many nonleaders (30 to 40%) also indicated they did not consider themselves proficient on the marksmanship tasks, but there were other tasks as well for which this was the case (e.g., CFF and SALUTE, HMD at night). At the other extreme, very few leaders (less than 10%) indicated that they considered themselves not proficient on six tasks, that is, more than 90% said they were proficient on these tasks/functions. No tasks fell in this category for the nonleaders.

Table 35
Percentage of Leaders and Nonleaders Indicating They Never Felt Proficient on LW Tasks/Skills (High to low)

% Indicating "Never Proficient"	**Leaders**	**Nonleaders**
40% and above *(High % not proficient)*		• Hit targets REF (46) • Hit targets indirect view (42) • Create/send CFF (42) • Use HMD for night navigation (40)
30 to 39%	• Hit targets REF (39) • Hit targets indirect view (35) • Detect targets REF (33)	• Detect targets REF (39) • Create/send SALUTE (36) • Zero the DVS (35)
20 to 29%	• Zero the DVS (21)	• Use overlays (27) • Plot basic symbols (25) • Change SA settings (24) • Troubleshoot (23) • Use voice/call groups (23) • Use measure tool (21) • Send/cancel CFM (21)
10 to 19%	• Use HMD for night navigation (17) • Plot basic symbols (16) • Use overlays (16) • Create/send CFF (16) • Troubleshoot (15) • Create/send SALUTE (14) • Change SA settings (10)	• Control SCU (19) • Configure messages (19) • Map operations (16)
Less than 10% *(Low % not proficient; high % proficient)*	• Use measure tool (9) • Map operations (6) • Use voice/call groups (5) • Configure messages (4) • Control SCU (4) • Send/cancel CFM (4)	

Note. Percentages based on the percentages in Tables 28-31.

The correlation between squad member and leader percentages on their "never proficient" percentages was examined. As might be expected, it was high and significant, r = .85, p < .001. The order of tasks was close to the reverse of that which occurred with the NET percentages. Thus the two groups agreed on the extent to which tasks were or were not well-trained in NET. For example, the scatterplot (Figure 14) clearly shows that both groups ranked the three marksmanship engagement tasks as the ones for which the greatest percentage of them did not achieve proficiency through either NET or unit training. Task percentages for leader and nonleaders were based on the mean of the company percentages.

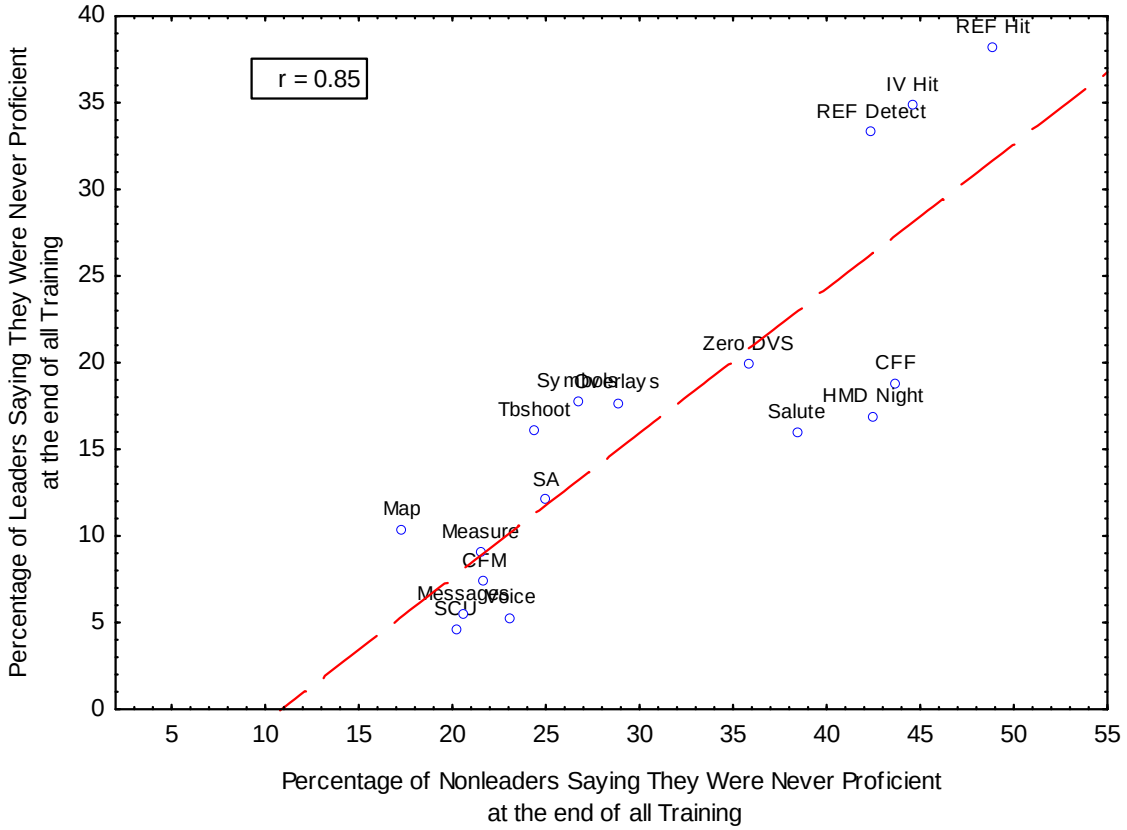


Figure 14. Correlation between tasks: Never proficient percentages for nonleaders and leaders.

Contribution of NET and unit training to proficiency. This section includes selected graphic representations of the percentages of nonleaders and leaders who indicated whether NET or unit training resulted in proficiency on selected LW tasks/functions. In addition, the graphs show the percentage of individuals who indicated they were never proficient. These three percentages sum to 100% (i.e., proficient in NET, proficient in unit training, or never proficient). The breakdown for leaders and nonleaders by company is illustrated, as well as the results for all companies combined. The overall percentages in these figures represent the mean of the company percentages. No new information is presented in these graphs; rather the proficiency

percentages are displayed jointly to provide a global picture of the trends that have already been presented.

Figure 15 shows the use of LW voice communications, for which a high percentage of both nonleaders and leaders indicated they became proficient on this task in NET. Consistent with the prior analyses, the graph also indicates that more of the leaders in the three companies gained proficiency during unit training, with a low percentage indicating they were not proficient. In contrast, a higher percentage of nonleaders indicated they were never proficient, and a lower percentage, compared to the leaders, acquired proficiency in unit training.

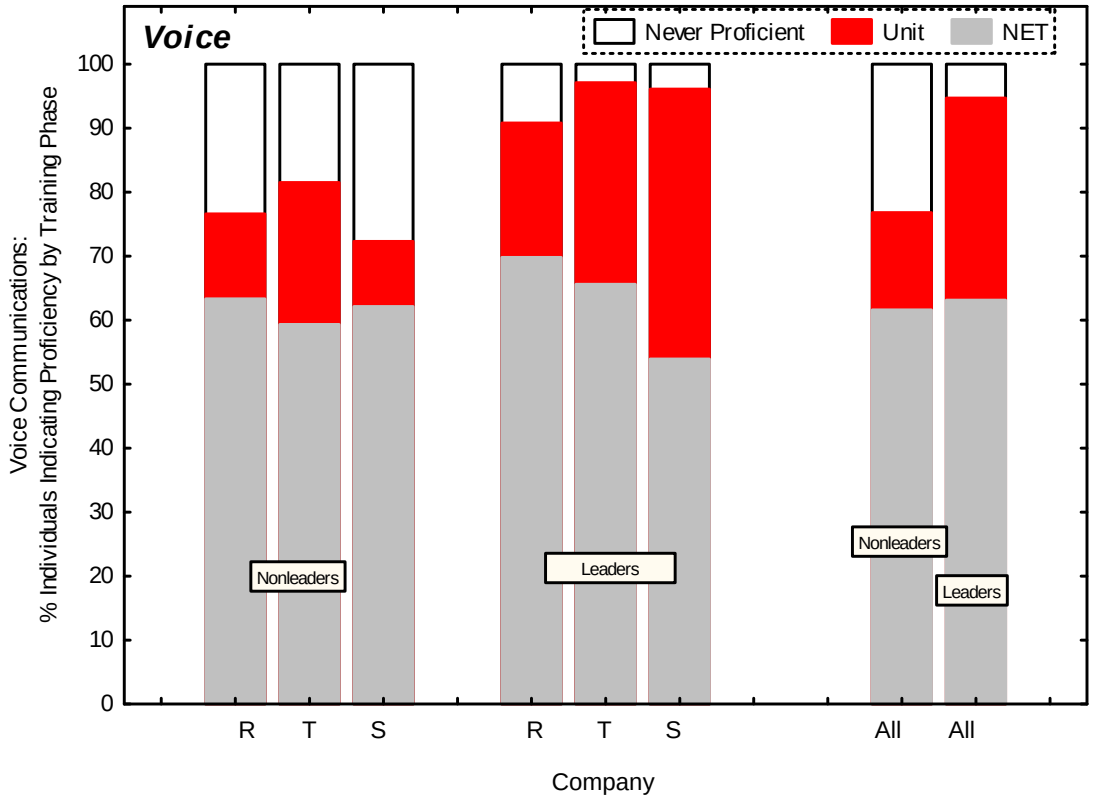


Figure 15. Percentage of individuals indicating proficiency with voice communications at different phases of training.

Figure 16 shows one of the marksmanship tasks for which a high percentage of both leaders and nonleaders indicated they were never proficient at the end of all training. The task shown is "hit targets at 150m from a reduced exposure position." There were no significant differences between leaders and nonleaders on this skill, nor between companies. The graph shows the low percentage of individuals who indicated they were proficient in NET, and that unit training did not contribute greatly to proficiency. Similarities across companies are evident.

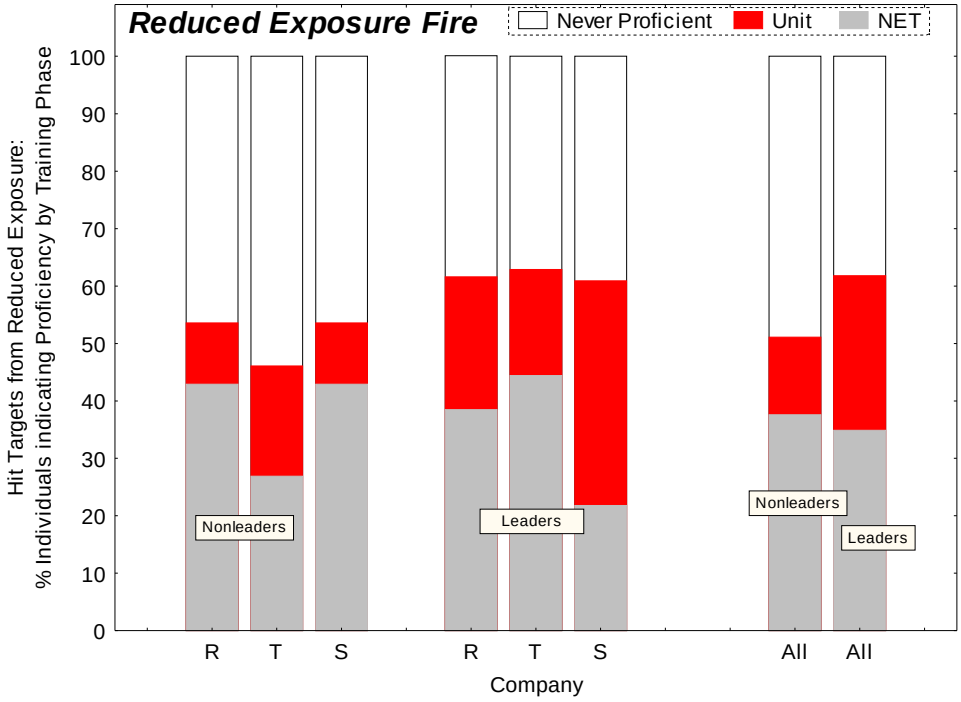


Figure 16. Percentage of individuals indicating proficiency in hitting targets from a reduced exposure position at different phases of training.

Figures 17 through 21 show additional tasks/functions from different domains. They also illustrate some of the variations that occurred within companies, particularly the leaders, although these variations were not statistically significant. A common pattern in these graphs is that the T Company leaders were more likely to indicate they were proficient than leaders in R and S Companies on specific tasks. This pattern may account for the significantly higher rating by T Company leaders on the ability of their unit to employ the LW system (refer to Figure 11). As the prior data analyses showed, the graphs clearly illustrate the tendency for leaders, rather than nonleaders, to indicate they gained proficiency during unit training. A third pattern in most of these figures is a greater consistency in the ratings by nonleaders than leaders across the companies; there is more variation among the leaders. The LW tasks/functions in these graphs are: changing SA settings, using overlays, using symbols, create/send SALUTE messages, and use of the HMD for night navigation.

Figure 17 shows the same results for the task on changing the SA settings in the LW system. In this case, the profiles of nonleaders were relatively similar across companies, but the leaders in the three companies tended to have different profiles. Most R Company leaders indicated they gained proficiency during NET. Most T Company leaders gained proficiency during unit training. The percentage of S Company leaders who indicated they gained proficiency during NET and unit training was about the same.

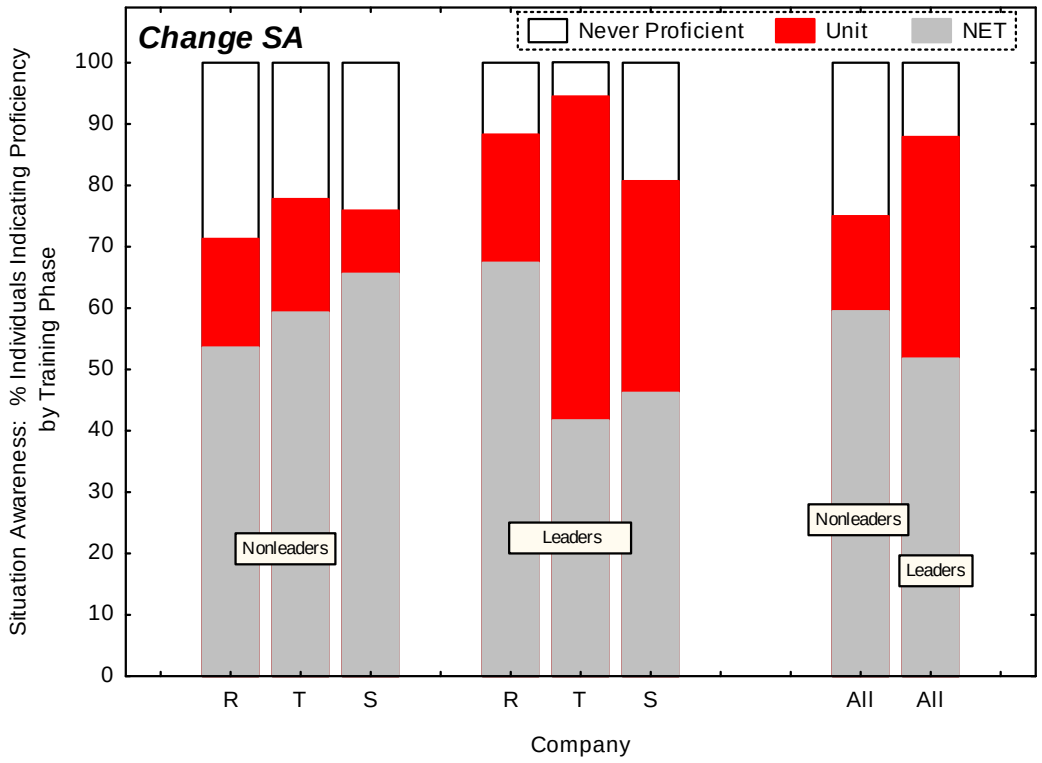


Figure 17. Percentage of individuals indicating proficiency with LW situation awareness features at different phases of training.

The next graph, Figure 18, shows the same results for using overlays. The graph clearly shows that leaders were more likely to indicate they gained proficiency using overlays in the unit training than was the case for nonleaders. The graph also shows differences across companies for both nonleaders and leaders. Very few nonleaders in R Company indicated they gained proficiency in unit training. More leaders in T and S Companies indicated they gained proficiency in unit training, whereas leaders in R Company indicated they gained proficiency in NET. Also T Company had the fewest leaders who indicated they were never proficient.

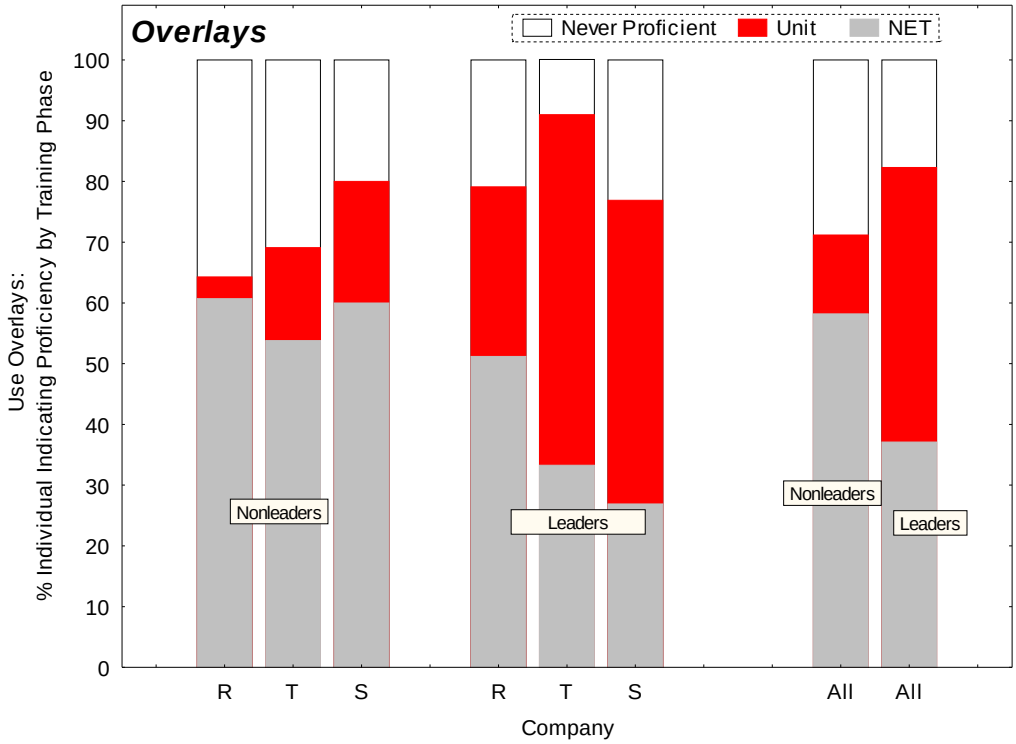


Figure 18. Percentage of individuals indicating proficiency with overlays at different phases of training.

Figure 19 depicts proficiency responses to the question on "placing and moving symbols such as waypoints and checkpoints on the map." One major point shown by this graph is the low percentage of nonleaders in all companies indicating that they gained proficiency during unit training as compared to leaders. The other major point is the low relative contribution of NET training to proficiency in basic symbols training compared to additional benefits from unit training.

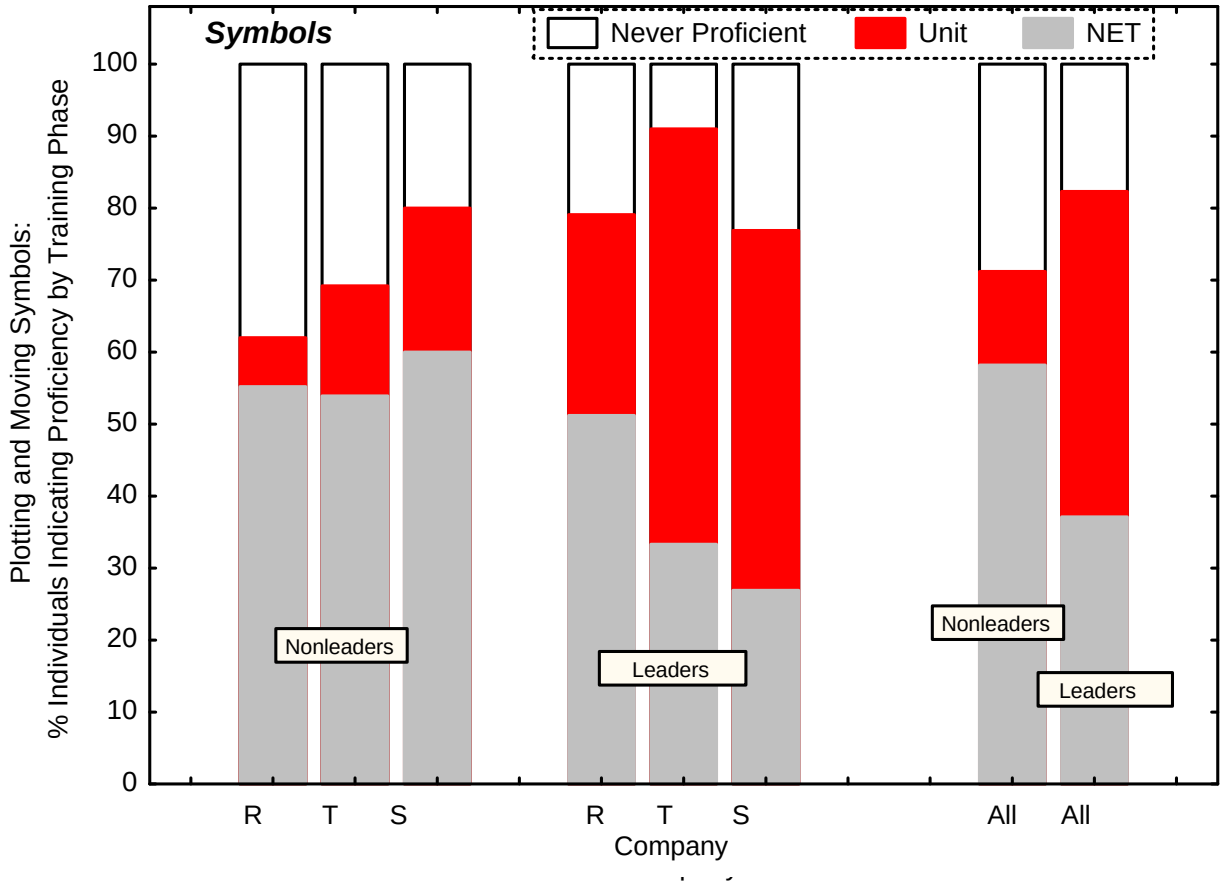


Figure 19. Percentage of individuals indicating proficiency in basic symbol operations at different phases of training.

Figure 20 depicts proficiency ratings in sending SALUTE messages. Results on SALUTE are shown primarily because it is a common message, but also because of the variation in nonleader responses in the three companies. All nonleaders indicated that unit training did not contribute to proficiency. But the contribution of NET to self-perceived proficiency ranged considerably, from 32% to 75%. It is not known what caused these different patterns.

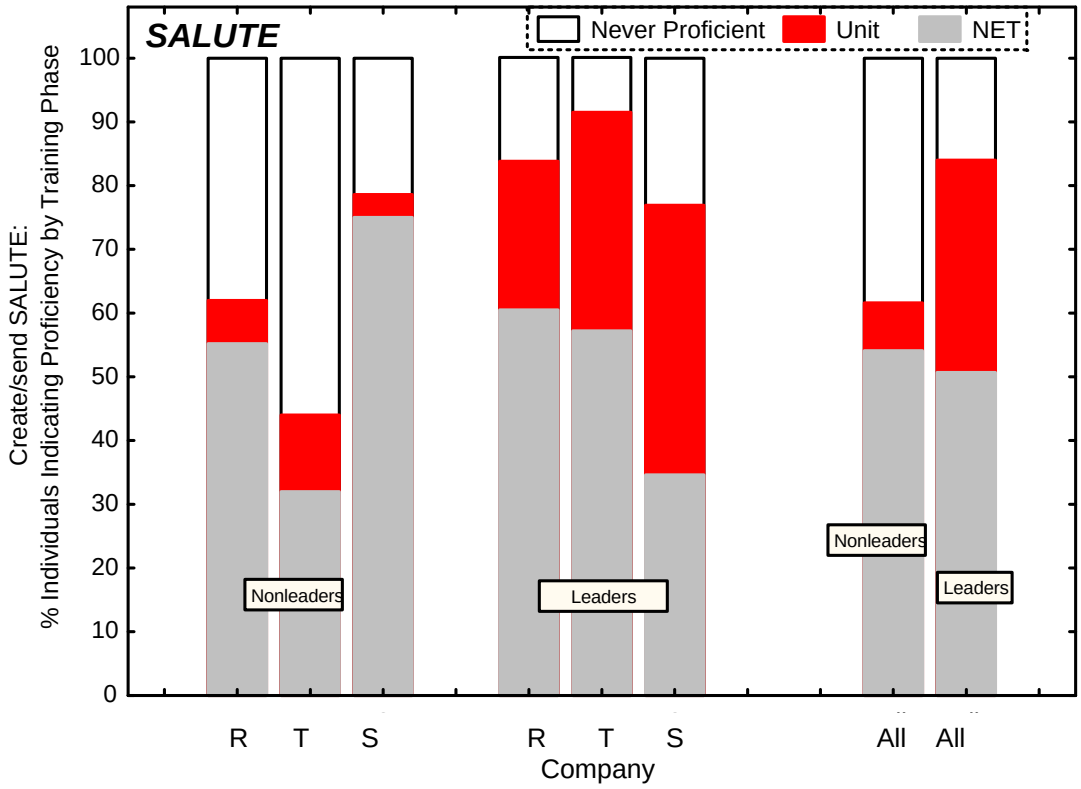


Figure 20. Percentage of individuals indicating proficiency in creating and sending SALUTE messages at different phases of training.

The last figure depicts employing the HMD at night. The patterns here are consistent with other LW functions. However, of interest is the similarity in the percentage of both leaders and nonleaders indicating that NET contributed to proficiency. The results are consistent with what occurred in NET; there was no night training. However the NET percentages are higher than one might expect given the lack of night training.

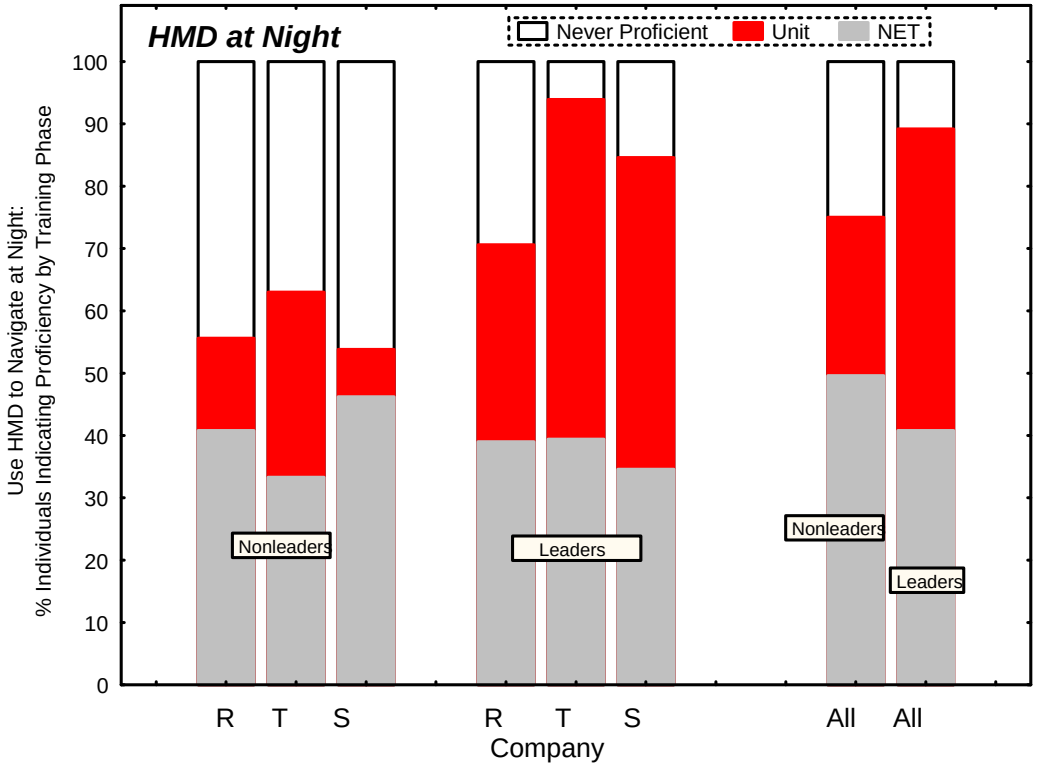


Figure 21. Percentage of individuals indicating proficiency in employing the HMD to navigate at night at different phases of training.

Dimensions Underlying the Unit Use and Proficiency Ratings

Data reduction analyses were conducted to gain insight into the primary dimensions underlying the usage and proficiency questions, as well as provide insight into the design of the future NET POI. Factor analyses were conducted on both the usage and proficiency questions asked of leaders and nonleaders. In all cases, a principle components analysis was conducted first, followed by a varimax rotation. Interpretation of the factor structure was based on the varimax rotation results.

Factor analyses of unit usage questions. For the usage questions, separate leader and nonleader analyses used all the questions given to each respective group. It will be recalled that leaders had more questions. For leaders, six primary dimensions accounted for 74% of the total variance. For nonleaders, four primary dimensions accounted for 67% of the total variance.

For nonleaders, the primary dimension (41% of the variance) reflected interactions with the SA displays, manipulating the map, voice communications, and receiving and viewing overlays and orders. The next two factors, which jointly accounted for an additional 19% of the variance, reflected various combinations of skills with four different messages. The last factor, which accounted for an additional 7% of the variance, reflected DVS use, sending CFM message, and viewing digital images.

For leaders, the primary dimension (39% of the variance) included questions on the primary LW skills covered in the survey: use of SA displays, manipulating the map, sending and receiving free text messages, voice communications, and receiving and viewing orders and overlays.[7] The second factor, accounting for an additional 10% of the variance, was clearly a leader planning dimension, with high loadings from create and modify overlays, and create orders and modify orders. The third factor, accounting for an additional 8% of the variance, was use of SALUTE messages and planning tools – MDP and MDSE. The fourth factor, accounting for an additional 7% of the variance, reflected weapon subsystem skills (DVS, STORM, and TWS). The last two factors, jointly accounting for an additional 9% of the variance, reflected usage of other messages plus viewing digital images.

In summary, these analyses imply different skill dimensions that can impact LW use and should be addressed in training. The factor structure, admittedly, is stronger for leaders than nonleaders. There appear to be general skills relating to use of the LW interface display. The message factors evidenced for the nonleader group may simply reflect the preponderance of questions given to them (8 of 15). For leaders, it is important to note that beyond a general use factor, there were two other distinct factors; one on mission planning and one on weapon subsystem skills.

Factor analyses of proficiency questions. For leaders, four primary dimensions accounted for 73% of the total variance. For nonleaders, three primary dimensions accounted for 75% of the total variance. As with the use analysis, there were more items for leaders than nonleaders.

For nonleaders, the primary dimension (60% of the variance) reflected proficiency in using the software interface (cursor, e-mail functions, changing SA, changing call groups, manipulating the map, using the measure tool). In addition, troubleshooting proficiency loaded on this factor as did overall ability with the system. The next factor, which accounted for an additional 9% of the variance, reflected more technical skills – proficiency with symbols and use of overlays, the CFF/SALUTE/CFM messages, zeroing the DVS, and using the HMD at night. Overall ability with the system also loaded on this component. The last factor, which accounted for an additional 6% of the variance, reflected weapon proficiency with the DVS (detect targets, engaged from reduced exposure position, use indirect view firing).

For leaders, the primary dimension (44% of the variance) reflected proficiency in using interface with the software interface (cursor, e-mail functions, calling call groups, manipulating

[7] Questions with loadings greater than .55 were used to characterize each factor. Typically, the loadings were greater than .60.

the map, using the measure tool), as well as using all three messages (CFF/SALUTE/CFM). In addition, troubleshooting loaded on this dimension. It differed from the first nonleader dimension in that overall ability with the system did not load on this factor. The second factor, accounting for an additional 17% of the variance, was clearly a weapons subsystem factor, as all six items relating to firing with the weapon with either the DVS or TWS loaded on this factor. The third factor, accounting for an additional 7% of the variance, was a combination of changing SA displays, placing symbols on the map, using overlays received, and using the HMD at night. Of interest is that overall ability with the LW system loaded on this factor. The last factor, accounting for an additional 5% of the variance, was characterized primarily by two other skills: troubleshooting, and zeroing the DVS.

In summary, these analyses also indicated that there are distinct dimensions underlying all the skills required to effectively use the total LW system. The skills are not restricted to basic interface operations, but also reflect the unique components of the system (e.g., weapon devices) and the unique responsibilities of individuals in certain duty positions (e.g., leader planning). All these factors should be considered in designing the POI. Lastly, it is of interest to note that the skills associated with leaders' and nonleaders' perception of their overall skill with the system differed. In other words, what does proficiency with the system mean to the individual Soldier? For nonleaders, proficiency appeared to be linked to basic operator skills. For leaders, proficiency appeared to be linked to some of these skills, but also to specific skills relating to use of the display -- overlays, symbols, and night operations.

Relationship between Unit Use and Proficiency Ratings

As indicated previously, one-to-one relationship between the tasks and skills addressed in the usage and proficiency questions in the consolidated survey did not exist. Yet, it was important to examine relationships between similar tasks and skills, whenever possible, in the process of developing the recommended POI.

This first step was to obtain insight into the overall relationship between the usage and proficiency measures. All usage questions were used to jointly predict the responses to the single question on overall proficiency with the LW system via a multiple regression analysis. For leaders, all leader use questions were included. The corresponding multiple R was .68 for leaders; .38 for nonleaders. Thus the usage questions were better predictors of this particular proficiency measure for leaders than nonleaders.

To obtain a better understanding of the association between use and proficiency, specific relationships were examined (see Table 36). The major associations involved "use/non use" of the map display, messages, the weapon subsystem, and leader planning with similar proficiency measures. A Chi-square analysis was conducted for each pairing of use and proficiency responses by using the collapsed categories for the usage and proficiency questions presented previously in this report.

Table 36
Template for Examining Associations Between Use and Proficiency Ratings

Unit Use Questions	Proficiency Questions
All Individuals	
• Manipulate map display • View SA display	• Cursor • Change SA settings • Manipulate map (zoom, pan…) • Measure distance/tool • Place and move symbols on map Use of overlays sent to you • HMD at night
• Send SALUTE	• Send SALUTE messages • e-mail functions
• Send Free text	• e-mail functions
• Send CFM	• Send CFM message • e-mail functions
• Send CFF	• Send CFF messages • e-mail functions
• Use DVS	• Zero DVS • Detect targets from reduced exposure position (DVS) • Engage targets from reduced exposure position (DVS) • Engage targets using indirect view (DVS)
• Use voice communications	• Set up and use voice/call groups
• Receive/view overlays • Receive/view orders	• Use overlays
Leaders only	
• Create overlays • Modify overlays • Create orders • Modify orders • Use MDSE	• Use of overlays sent to you

Note. The consolidated survey did not have a proficiency question on sending free text messages.

Tables 37 through 42 show the detailed results for the Chi-square analyses for all individuals. Also noted in the tables are the results from separate analyses with the leader and nonleader groups.

Tables 37 and 38 address two similar usage functions: view SA displays and manipulate the map display. The results revealed similar significant patterns of association. For example, individuals who viewed SA displays or manipulated the map display during unit training were likely to indicate that they gained proficiency during NET and unit training. On the other hand, those who indicated they did not use SA or map displays during unit training were more likely to

indicate they were never proficient or were proficient during NET. Twelve of the 14 associations examined in Tables 37 and 38 demonstrated this pattern (were significant) for all individuals. The leader and nonleader subgroup analyses clearly showed that this pattern was typical of leaders and less typical of nonleaders. Apparently, the reason for the overall significance resulted from the contribution of the leader responses to the overall analyses. (Note. A nonsignificant association meant that the distribution of proficiency responses was the same across the three proficiency categories regardless of whether a particular capability was used or not used during unit training.)

Table 37
Map Use and Proficiency Associations

Use of Map Display During Unit Training		**% Individuals**			**N**	**Description of Significant Effects**
		Never Prof	Prof in NET	Prof in Unit		
		Cursor				
Manip Map Display	Not Use	15%	72%	13%	61	Not significant
	Use	9%	69%	22%	147	
		Manipulate map (zoom, pan ..)				
Manip Map Display	Not Use	17%	70%	13%	60	
	Use	8%	72%	20%	144	
		Change SA settings				
Manip Map Display	Not Use	25%	65%	10%	60	Significant
	Use	13%	56%	32%	144	
		Measure/distance tool				
Manip Map Display	Not Use	21%	71%	9%	58	Use related to NET and Unit proficient ratings
	Use	11%	62%	27%	141	
		Place & move symbols on map				
Manip Map Display	Not Use	30%	57%	13%	60	Nonuse related to never and NET proficient ratings
	Use	15%	56%	29%	142	
		Use overlays sent to you				
Manip Map Display	Not Use	30%	58%	12%	59	
	Use	16%	48%	36%	141	
		HMD at night				
Manip Map Display	Not Use	47%	39%	14%	57	
	Use	19%	40%	41%	133	

- For leaders, all associations, except for cursor proficiency, were significant, with the same pattern of association occurring for all individuals, as presented in the last column of the table.
- For nonleaders, the only significant association was that between manipulating the map display and proficiency with the HMD at night.

Table 38
SA Display Use and Proficiency With the Map Display Associations

Use of SA Displays During Unit Training		**% Individuals**			**N**	**Description of Significant Effects** Each association was significant
		Never Prof	Prof in NET	Prof in Unit		
		Cursor				
View SA Displays	Not Use	18%	72%	10%	79	
	Use	6%	69%	25%	131	
		Change SA settings				
View SA Displays	Not Use	25%	64%	12%	77	
	Use	11%	56%	33%	129	
		Manipulate map (zoom, pan ..)				Use related to NET and unit proficiency ratings Nonuse related to never and NET proficient ratings
View SA Displays	Not Use	20%	71%	9%	77	
	Use	5%	72%	23%	129	
		Measure/distance tool				
View SA Displays	Not Use	20%	70%	10%	74	
	Use	9%	62%	28%	127	
		Place & move symbols on map				
View SA Displays	Not Use	29%	58%	13%	77	
	Use	14%	56%	31%	126	
		Use overlays sent to you				
View SA Displays	Not Use	31%	56%	13%	77	
	Use	14%	47%	39%	125	
		HMD at night				
View SA Displays	Not Use	44%	39%	17%	75	
	Use	16%	40%	44%	117	

- For leaders, the same associations were significant, with the same pattern of association, except for two items. Viewing the SA display did not relate to measure/distance tool and cursor proficiency.
- For nonleaders, none of the associations between use and proficiency were significant.

In general, there were few associations between message use during unit training and the self-ratings of proficiency with messages. Use of the SALUTE message did, however, relate to perceived proficiency with SALUTE and use of e-mail functions (see Table 39).

Table 39
Message Use and Proficiency Associations

Use of Messages during Unit Training		**% Individuals**				**Description of Significant Effects**
		Never Prof	Prof in NET	Prof in Unit	**N**	
		Send SALUTE messages				Significant
Send SALUTE	Not Use	31%	54%	15%	137	
	Use	7%	61%	32%	62	Use related to NET and unit proficiency ratings
		e-mail functions				
Send SALUTE	Not Use	13%	68%	18%	142	
	Use	3%	67%	30%	63	
		Send CFF				Nonuse related to

Use of Messages during Unit Training		% Individuals			N	Description of Significant Effects
		Never Prof	Prof in NET	Prof in Unit		
Send CFF	Not Use	31%	50%	19%	166	never and NET proficient ratings
	Use	4%	58%	38%	24	
		e-mail functions				
Send CFF	Not Use	12%	68%	20%	174	
	Use	4%	59%	37%	27	
		Send CFM				
Send CFM	Not Use	14%	69%	17%	152	Not significant
	Use	4%	71%	25%	52	
		e-mail functions				
Send CFM	Not Use	12%	68%	20%	154	
	Use	6%	65%	29%	52	
		e-mail functions				
Send Free Text	Not Use	14%	65%	21%	93	
	Use	7%	697%	24%	112	
• The nature of the associations for the leader and nonleader subgroups differed somewhat from that which emerged when all individuals were used in the analyses. • Specifically, the only significant association at the subgroup level was that between sending SALUTE messages and self-perceived proficiency in using SALUTE messages for leaders. All other associations for both groups were not significant.						

For the weapon subsystem, specifically the DVS, the common pattern (significant) was that DVS use during unit training related primarily to perceived proficiency during unit training. Nonuse of the DVS during unit training related to never proficient ratings.

Table 40
Weapon Subsystem Use and Proficiency Associations – DVS questions

DVS Use in Unit Training		% Individuals			N	Description of Significant Effects
		Never Prof	Prof in NET	Prof in Unit		Each association was significant
		Zero DVS				
Use DVS	Not Use	30%	47%	24%	146	
	Use	14%	31%	56%	36	Use related primarily to unit proficient ratings
		Detect targets with DVS				
Use DVS	Not Use	40%	44%	16%	145	
	Use	11%	37%	51%	35	
		Engage targets with reduced exposure fire				Nonuse related primarily to never proficient ratings
Use DVS	Not Use	48%	38%	14%	143	
	Use	21%	35%	44%	34	
		Engage targets with indirect view techniques				
Use DVS	Not Use	42%	44%	14%	144	
	Use	21%	35%	44%	34	
• For leaders, the same associations were significant, with the same pattern of association. • For nonleaders, the same significant associations occurred for detect targets and engage targets with reduced exposure fire. DVS use was not associated with zeroing and indirect view fire proficiency.						

Table 41 shows the results for voice communications and receiving/viewing orders and overlays. Use of voice communications during NET did not relate to proficiency in establishing different call groups. The profiles for "users" and "nonusers" were the same, with most individuals indicating proficiency with call groups being acquired in NET training. However, proficiency in working with sent overlays related to the propensity to receive/view overlays and orders in unit training.

Table 41
Voice Communications Use and Proficiency Associations, and Overlay Use and Proficiency Associations

Use of Voice Communications and Viewing Overlays During Unit Training		**% Individuals**			**N**	**Description of Significant Effects**
		Never Prof	Prof in NET	Prof in Unit		
		Proficiency in set up and use of call groups via SCU and WUID s				
Use voice Commo	Not Use	21%	63%	16%	38	Not significant
	Use	11%	66%	23%	165	
		Proficiency in Using Overlays Sent to You				Significant Use related to NET unit Proficiency Nonuse related to never and NET Proficient ratings
Rec/View Overlays	Not Use	30%	58%	11%	89	
	Use	11%	44%	45%	109	
		Proficiency in Using Overlays Sent to You				
Rec/View Orders	Not Use	26%	57%	16%	110	
	Use	13%	42%	45%	91	
• For leaders, the association results were the same as those for all individuals, as shown above. • For nonleaders, no association was significant.						

Lastly, leader unique questions that related to mission planning were examined. With the exception of creating overlays, the other mission planning functions related to self-proficiency ratings on ability to use overlays they received. Although the number of "users" was low, the fact that typically 70% or more indicated they were proficient during unit training, and that few or none indicated a lack proficiency is of interest. These results are the strongest evidence for the extent to which the use of a LW function during training positively impacted perceived proficiency.

Table 42
Mission Planning Function Use and Proficiency Associations – Leaders only

Use of Mission Planning Functions during Unit Training		**% Leaders**			**N**	**Description of Significant Effects**
		Never Prof	Prof in NET	Prof in Unit		
		Proficiency in Using Overlays Sent to You				
Create Overlays	Not Use	20%	45%	35%	75	Not significant
	Use	8%	36%	56%	36	
		Proficiency in Using Overlays Sent to You				Significant

Use of Mission Planning Functions during Unit Training		% Leaders			N	Description of Significant Effects
		Never Prof	Prof in NET	Prof in Unit		
Modify Overlays	Not Use	20%	47%	33%	83	
	Use	4%	29%	68%	28	Use related to unit Proficiency ratings
		Proficiency in Using Overlays Sent to You				
Create Orders	Not Use	19%	45%	36%	95	
	Use	0%	25%	75%	16	Nonuse related to never and NET Proficiency ratings
		Proficiency in Using Overlays Sent to You				
Modify Orders	Not Use	19%	46%	35%	94	
	Use	0%	22%	78%	18	
		Proficiency in Using Overlays Sent to You				
MDSE	Not Use	21%	45%	34%	87	
	Use	0%	23%	77%	22	

Other Training Questions in the Survey

Five other questions on NET were in both versions of the consolidated survey. Three asked how successful NET was in training individuals to maintain the system, to troubleshoot the system, and to sustain the system (e.g., charging batteries). A fourth question asked whether they had sufficient hands-on training in NET. The fifth question focused on how often perishable skills should be trained in the unit.

Responses to all questions are in Table 43. Company by leader/nonleader analyses[8] showed significant effects only on the perishable skill question.

Table 43
Additional Questions on Adequacy of NET and on Sustaining LW Skills

Question	% of Leaders	% of Nonleaders
NET success in training how to maintain the LW system		
Very unsuccessfully	4	10
Unsuccessfully	15	14
Successfully	74	64
Very Successfully	8	12
NET success in training how to troubleshoot the LW system		
Very unsuccessfully	11	16
Unsuccessfully	26	30
Successfully	57	42
Very Successfully	7	12
NET success in training how to sustain the LW system		
Very unsuccessfully	4	8
Unsuccessfully	9	12
Successfully	74	63
Very Successfully	13	18

[8] MANOVA conducted on troubleshooting, maintain, and sustain questions. Univariate ANOVAs on hands-on training and perishable skill training frequency.

Question	% of Leaders	% of Nonleaders
Sufficient hands-on training in NET		
Strongly disagree	3	6
Disagree	9	9
Neutral	16	24
Agree	57	45
Strongly Agree	15	16
Frequency of training perishable skills in the unit		
Weekly	21	14
Monthly	32	27
Quarterly	24	22
Semi-annually	7	13
Annually	15	23

Note. Leader and nonleader percentages are based on the mean of the three companies.

Of the three questions on maintaining, troubleshooting and sustaining the system, the most positive responses were on maintaining and sustaining. For troubleshooting, 37% of the leaders indicated NET was successful; 46% of the nonleaders said it was successful. The percentage of leaders was similar to the question on proficiency with troubleshooting skills in that 40% of the leaders said NET made them proficient (refer to Table 32). There was less agreement between these two questions for the nonleaders, as 57% of the nonleaders said NET made them proficient (refer to Table 32).

The amount of hands-on training was perceived as being adequate by more than a majority of the leaders and non-leaders. The significant difference on refresher training of perishable skills showed that leaders were more likely than nonleaders to say that these skills should be trained frequently (weekly or monthly; 53% for leaders and 41% for nonleaders). On the other hand, nonleaders were more likely to say these skills should be trained on a semi-annual or annual basis (36% of nonleaders; 22% of leaders).

Individuals from the Battalion elements who received NET responded similarly to the individuals from the Infantry companies on the maintaining, troubleshooting, and sustaining system questions as well as the hands-on training questions. They responded positively. With regard to training of perishable skills, there was little agreement on the recommended frequency. For example, the leader responses were about equally distributed among all response categories, from weekly to annually.

Focus Groups

The focus group sessions, a total of 11, were held after individuals completed the consolidated survey. Each group was small, consisting of 4 to 10 individuals, for a total of 58 individuals participating from the Battalion. For each company, one focus group consisted of individuals at the rank of platoon sergeant and above, a second group of squad and team leaders, and a third group of nonleaders. Two other groups consisted of recon team leaders and above, and engineer team leaders and above, respectively. Leaders accounted for the majority of the participants (76%, 44 of 58). The majority (over 90%) of the comments regarding training and use of the system was from the leader focus groups. No one from Company headquarters participated in the focus groups.

A focus group protocol was developed by TRAC-MTRY with input from the DOTMLPF working group. Training questions were included in the protocol. However, not all groups were asked identical questions, as the focus group facilitators attempted to tailor the questions to the experience and background of the group participants. ARI was given the recorder's notes that were taken during each focus group. These notes serve as the basis for what is presented in this section.

Focus Groups: Results

Training questions and training-related questions dealt with the length of NET, the class size, ratio of trainers to Soldiers, training on specific LW equipment and capabilities, collective training, use of system capabilities during and after NET, and system maintenance/ troubleshooting. The use of system capabilities after NET was of interest as comments on usage and employment could provide insights into how well individuals were trained.

Several caveats are made about the focus group records and the information presented in this section. Given the open-ended nature of the focus groups, it was not possible to quantify the responses as was the case with the surveys. Simply because an area was not cited during the focus groups, does not mean it was irrelevant or unimportant. In addition, not all groups commented on the same topics; thus it was not possible to made quantitative comparisons. In addition, it is not known whether other individuals within a focus group agreed or disagreed with the comments that were made. In almost every focus group, individuals expressed frustration about system unreliability and had negative reactions/experience regarding some aspects of the system design. It was not possible to determine how and to what extent these reactions impacted answers to the training questions, but such interactions probably occurred. The information presented here, simply documents what was said when a training-related comment was made.

Length of NET and topics in NET. The most common comment on the length of NET was that it only requires about two days to learn the basics of system operation, as the system interface is pretty simple to learn. Statements regarding the length of NET typically referred to training on the software interface only, which was primarily skill level 1 functions. Some stated that NET gave them everything needed at the Soldier, and at the squad and team leader levels. It is important to point out that these comments only referred to a portion of the NET requirement; they did not refer to the collective phase of NET, training on specific equipment such as the

DVS, STORM, MDSE, etc. They did not comment on the time required to assess Soldier performance.

A few leaders commented on wasted time in the classroom portion of NET. An example given was that an individual would have about 15 minutes of hands-on time, and for the remainder of the hour he would not do anything with the system. Another reported that there was wasted time, and that the explanations of system operation were overly complicated. Other leaders indicated that senior personnel could learn the system faster than nonleaders. Consequently, if the LW system were given to only team leaders and above, the training could be more efficient (shorten from two weeks to approximately one week) for "operator" training.

There was acknowledgement by the leaders that some aspects of the LW system, particularly, the planning process, would require specific training beyond the basic system operation. They indicated that to create doctrinally correct overlays and orders would require more emphasis in NET. One individual commented specifically that he felt NET did not have sufficient training in these two areas. Leaders also stated that the MDSE required specific training; they estimated two days in length. The consensus was that individuals at the platoon level and above should receive this training (not squad and team leaders). One reason given for restricting MDSE training to individuals at the platoon level and above was because both squad and team leaders need knowledge/training on the military decision-making process to create doctrinally correct graphics and orders. However, squad and team leaders can and do plot some graphics such as a route, that do not require extensive training on graphic control measures. Some individuals indicated that perhaps the radio-telephone operator (RTO) or even the medic should receive MDSE training in order to assist the leaders during their planning. Another option would be to have an MDSE "guru." One individual commented that squad leaders should get some backup training on orders given the likelihood of leader attrition.

Consistent with the above feedback was the statement by a leader that the LW skills varied with the echelon. For example, the platoon leader builds a plan, and nonleaders use the "mouse." A few leaders indicated some Soldiers would either have trouble processing a lot of information in an overload situation or in learning the more advanced features of the LW system.

One comment was made regarding the training materials on system operation. It was felt they needed to be more user-friendly – not just one large pamphlet. Laminated cards were suggested by one leader, particularly for maintenance.

A limited number of leaders and nonleaders were concerned about establishing and maintaining basic Infantrymen skills. The concern was that if Soldiers are trained on LW only they will not know what to do without the system, that they would lose basic skills, and that the basic skills are necessary for effective use of the system. It was noted that training on both basic and LW skills increases the training load.

Class size for system interface training. Regarding class size, the only comments made were that it should be smaller. Positive reactions to the small-group focus (1 instructor per 6 to 9 individuals) in the classroom were made. One suggestion was that class size should be equivalent to a platoon.

Collective exercises. The feedback on collective training varied. Some felt that unit collective exercises after NET did not contribute to proficiency; that these exercises did not contribute anything additional above the land navigation and movement formations in NET. Others indicated that because the battalion leadership forced use of the LW system, they became more proficient with it instead of falling back on what was comfortable for them; they learned its limitations and advantages.

One leader from the company that participated in the LUT indicated that the company missions were valuable, as he was able to watch the other platoons and could coordinate better because of that type of exercise. But he felt that same type of benefit was not as evident in squad exercises. Another leader indicated that their company learned more about the system and how to use/employ it because of LUT.

Use of system features. Overlays (doctrinally correct or improvised to meet the situation) were cited as one feature that was used often in unit exercises. Examples given were: phase lines, check points, routes, enemy contacts, trenches, the objective, location of the support by fire element, display of the front line trace or lead element of the unit, link-up, obstacles, and improvised explosive devices, and use as a time-line. One leader commented that overlays were useful when he was outside the hatch of his Stryker, as he could not see FBCB2 in this position. Other comments were that overlays provided knowledge of the mission, enabled them to anticipate where the enemy was coming from, took out some of the guess work, and in general helped situational understanding of the mission. Leaders indicated they used overlays frequently and received them frequently. Lastly, a leader commented that he saw benefits for team leaders and nonleaders; overlays helped them to be informed and aware of the situation before they dismounted the Stryker.

In contrast to the feedback on overlays, more than one leader indicated that he would not use the LW system to disseminate (e-mail) and brief an order. One leader indicated he wanted eye-to-eye contact to check that others understand the order and so questions could be asked of him. The recommendation was to do orders face-to-face, but to send overlays over the network.

Use of the HMD for SA and overlay capabilities differed among the participants. Some commented that they left the HMD on their eye (but didn't like it there) and others indicated they flipped it in and out of position. Some commented on the icon clutter and the fact that all icons were the same color. Another indicated that he changed the SA filters as needed. A few commented on how they adapted to the SA screens: shrunk the icons, displayed a limited number of individuals, used the SA filters. Of interest, however, was that one leader indicated their unit encouraged Soldiers to use the CFM icon and to populate the map with enemy icons when time was available. Others also indicated use of the CFM icon and vehicle icons.

Other comments were made about employment of the HMD --- that it was beneficial for leaders to watch movements (to see the big picture, adjacent units, tracking unit movements). On the other hand, some commented that you could not look at the HMD and your buddy at the same time, and you could not use it when in contact on the objective. A specific comment was that the LW system does not help a leader give fire command and directions when on the

objective. You can lose SA when looking at the HMD when in contact and you also do not have time to look at the display in this situation.

With night operations, there were perceived advantages and disadvantages to the HMD. One leader indicated you needed to make a decision regarding which to use – night observation devices (NODs) or the HMD. A technique used by one leader was to wear his NODs, pull down the HMD when needed, turn it off, and then go back to NODs. Other comments were that you lost awareness at night with the HMD; you lost your night vision even if you only looked at the display for a short period of time; and that the glow from the HMD creates a light discipline problem. On the other hand, one leader indicated that use of the HMD allowed him to easily move to a position that had been predesignated by a scout. Once the movement was complete, he switched to his NODs. Another commented that there were no problems from shadowing of the sun on the display at night.

With regard to the DVS, comments pertained to the conditions in which it would and would not be useful. Examples given are as follows. Video capture features for active reconnaissance could be positive and the DVS could be used to suppress an enemy. But the DVS was not viewed as a lethality tool; you could not kill with it. Overhead (standing) and around the corner positions would not be used (hard to be stable, some positions were fatiguing). It would not be used in urban operations, as there is loss of momentum and surprise when trying to engage a target from around a corner. On the other hand, the capability was viewed as having an advantage in a firefight behind cover. Although target acquisition was perceived as being slow; some saw some applications for surveillance and reconnaissance.

Comments on voice communications typically focused on the multiple radios available to the Soldiers, not on training. Training-related comments pertained to using the mute capability, and that the radio enabled nonleaders to be alert and prepared during collective exercises, not necessarily that nonleaders needed to talk.

Digital text messages were used by a few leaders, when time permitted and they were not moving. When asked, one leader indicated he did not use the digital CFF, primarily because of time requirements and lack of confidence in the accuracy of the STORM.

Few comments were made regarding satellite imagery. However, when they were made, leaders indicated they used it, and found that transitioning between the digital map and satellite imagery was helpful.

System maintenance. Several leaders commented on the need to train some personnel to be technical experts or specialists within the unit, preferably the platoon, for communications and for system troubleshooting/maintenance. This would make the unit more self-sufficient and not as dependent on contractor logistics support teams. Additional training would be required for these Soldiers, as well as all Soldiers, so the unit could maintain the system in the field.

NET approach. Some commented that a train-the-trainer approach should be used, i.e., train specific individuals from the unit, who in turn would train the other platoon members. Others felt than new training should be on-the-job, as the LW system requires primarily hands-on training.

Focus Groups: Discussion

The comments by the leaders indicated they perceived the primary purpose of NET was limited to training how to operate the software interface. Given this perspective, these individuals indicated that the length of the NET could be as short as two days. Some recognized NET also needed to include the leader planning functions and associated equipment (e.g., MDSE). When asked about collective training, some thought the land navigation and movement training in NET was sufficient, although others indicated that they became more proficient with the system and how to employ it when the battalion leadership forced use of the system or because of their participation in LUT. Some leaders also stressed the importance of including additional training on system maintenance and troubleshooting. No comments were made on the adequacy of or time spent on marksmanship training with the DVS or TWS. Although the focus group participants provided estimates on the time required for NET, it was clearly impacted by their view of the purpose of NET. In the future, it appears that the broad purpose of NET needs to be made clear to the unit leadership as well as to all those being trained.

Participants in the focus groups indicated that there was a need to restructure the training. NET should accommodate the differences in the rate with which leaders and less experienced Soldiers can learn the LW system. NET should also tailor the scope of the training to features used by individuals at different echelons, particularly platoon leaders, squad leaders, and nonleaders. The class size should be reduced; but small-group exercises and instruction with 1 trainer per 6 to 9 individuals should be retained.

One way to enhance NET is to stress LW features that Soldiers find valuable; that impact individual and/or unit effectiveness. A clear example of a beneficial LW feature cited by the leaders was overlays. The saying that “a picture is worth a thousand words” is reflected in the positive comments regarding how “digital” overlays were used, as opposed to the negative comments on issuing orders over the network.

Leader comments regarding use of system features/capabilities, such as the HMD during the day and night, overlays, SA displays, filters for overlays, applications of the DVS, and messages, indicated they had achieved different levels of proficiency with these capabilities and had also learned different techniques for using them. One example is the different techniques cited regarding use of the HMD and NODs during night operations. Another example is that while some used the SA filters, others apparently did not, some shrunk the icons, etc. It is assumed that these skills and techniques were acquired after NET, as most of their illustrations were situations and conditions that did not occur in NET. An implication for NET is that it should be expanded and designed to enable leaders to learn, through structured exercises, how to best employ LW features --- to determine what works best for them and to gain the desired level of proficiency.

Lethality

A side experiment was conducted to examine the lethality (i.e., probability of hitting targets) using the DVS from reduced exposure defensive and hasty firing positions, as well as indirect view firing positions (engaging the target with the DVS, but not from a reduced exposure position). The firing results were analyzed by AMSAA. These results were also compared here to a reduced exposure firing experiment conducted by Dyer et al. (2005) with earlier versions of the LW system and the DVS on the M4 carbine. Lastly, the consolidated survey data were examined for potential relationships between Soldiers use of reduced exposure and indirect view techniques of fire and their confidence in these skills.

Experimental Procedures

Soldiers. Thirty (30) firers used the M4 carbine and nine (9) used the M249 SAW. The intent was to have ten (10) M249 firers, but equipment malfunctions resulted in a total of nine (9).

Day 1. Baseline firing. Soldiers with the M4 Carbine fired with either their CCO or ACOG. Team leaders and M249 gunners had EOTek sights. Prior to the experiment, firers had conducted weapon zero for the M4 and M249 with their baseline sights. All firing was conducted on a known distance (KD) range with targets at six distances --- 100, 200, 300, 400, 500, and 600 meters. Baseline firing was conducted from the prone supported position.

The M4 firers had 10 rounds per target. The M4 firing was conducted in two-round engagements with the time recorded from target exposure to first round, then time from target exposure to second round. This sequence repeated five times at each of the six ranges. The M249 firers used 7-round bursts (7-round belt). Engagement time was not assessed for the M249 firers.

Days 2 and 3. Reduced exposure and indirect view firing. All firers first boresighted and zeroed the DVS. For the M4 firers, two reduced exposure firing scenarios, defensive and hasty, and one indirect view scenario were conducted. The defensive reduced exposure fire (DREF) position was from a prone defensive position with the firer's head below sandbags. In the hasty reduced exposure fire (HREF) position, the firer was on a knee and fired from behind a wall. No sling was used. For each two-round hasty engagement, firers started from a standing position two paces back from barrier. On target exposure, the firer stepped forward and assumed a HREF position and made the engagement.

For the indirect fire scenario, the M4 gunners assumed a prone defensive position; the head/body could be exposed. This was referred to as indirect view fire (IVF). Rounds were the same as the baseline.

The M249 firers only executed the IVF. They also assumed a prone defensive position, and fired the same number of rounds as in the baseline.

The firer could use any of the three FOVs in the DVS: WFOV, NFOV, or the zoom capability based on the NFOV. The field of view used at each distance was the firer's choice; he selected the FOV that worked best for him. The FOV could vary with the target distance.

Individuals who did not complete their firing on Day 2, did so on Day 3. All firing was conducted (basecase and LW) in the same sequence (100m to 600m), and all Soldiers fired the LW series in the same sequence.

Train-up. The Company participating in this test had six weeks notice regarding the reduced exposure experiment. However, it is not known how much training the Soldiers received on reduced exposure and indirect view firing techniques during that time.

Experiment Results

Because the lethality data were analyzed by AMSAA and are reported in detail in another section of this DOTMLPF report, only the major findings are repeated here. They are based on an October 2006 briefing charts provided by AMSAA. Only the M4 firing data are discussed in this section, due to the limited number of M249 firers.

Overall, the AMSAA results showed that LW Soldiers' performance using the DVS on the M4 carbine in defensive reduced exposure positions and in defensive indirect view firing positions was similar to baseline weapon optics and was higher than from exposed (hasty) reduced exposure and indirect view firing postures.

The differences between defensive and hasty reduced exposure positions with the M4 carbine were consistent with prior reduced exposure data (Dyer et al., 2005). In the DOTMLPF lethality experiment the primary DVS FOV used was 6x. In the Dyer/ARI experiment, firers used 4x power on the DVS, as the DVS available at that time did not have 6x. Also, no indirect view firing was conducted in the ARI experiment. Figure 22 compares the data from the two experiments out to 300 meters, as that was the maximum range available in the ARI experiment. The AMSAA lethality data points are repeated in this graph. The ARI data points in the graph are those from the original experiment, where Soldiers fired at 75, 175, and 300m.

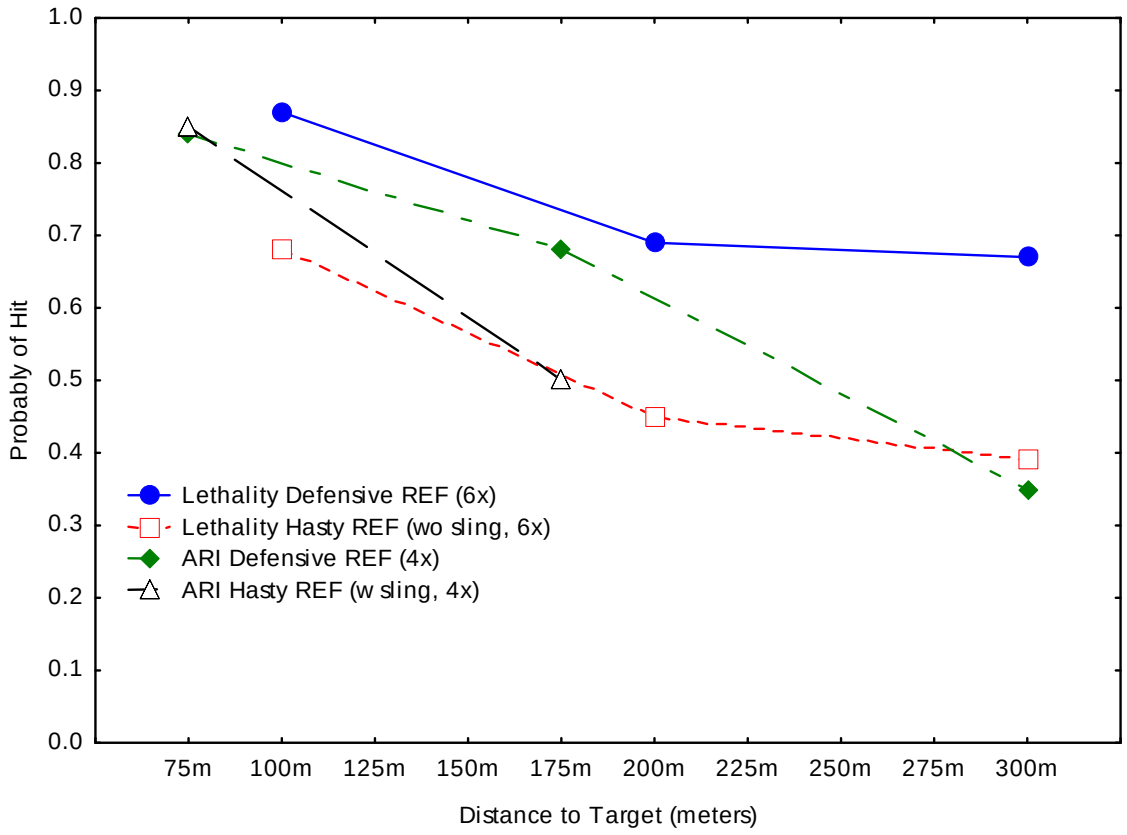


Figure 22. Reduced exposure fire comparisons: DOTMLPF lethality experiment and ARI experiment.

At 300 meters and from a reduced exposure defensive firing position, Soldiers in the lethality experiment had double the probability of hit compared to the earlier ARI experiment. However, within 200 meters the probabilities of hit from the defensive positions were similar. The difference could have been the greater DVS magnification available in the lethality experiment. In both efforts, performance was lower from hasty firing positions.

Dyer et al (2005) concluded that more training was needed in hasty firing positions to become proficient. Their results and observations of the firers showed that quickly achieving a stable position was difficult. They had limited time to train this position as the hasty trials were done as an excursion to the main experiment on defensive reduced exposure firing. Some of the ARI trials involved use of a sling, which was observed to provide a relatively quick stable position for Soldiers with sling experience. In addition, a sling was less tiring for all firers. It would appear that insufficient training also occurred for hasty firing positions in the DOTMLPF lethality experiment, as the results were similar to the Dyer experiment, where only limited training was possible.

The relationships between different applications (detect targets, engage targets) of the DVS and TWS to the training phase when Soldiers felt they were proficient with basically the same functions were examined. The consolidated survey had specific items on DVS and TWS usage which went beyond the two general questions cited previously in this report (from Question 1 in the Basis of Issue Section.

These specific questions are cited in the first column of Table 44 below and were included in Section II on Basis of Issue in the consolidated survey. These questions were dichotomous in that an individual indicated whether or not he used the sight for the application of interest. Only leaders had the TWS. The TWS results are not presented due to the limited number of leaders who said they used the TWS. Only two leaders said they used it to engage targets from reduced exposure positions and three said they used it to engage targets from the indirect view position.

The responses to the DVS use questions were then related to appropriate proficiency questions (from Question 1 in Section III on Training Implications) as presented in Table 44. It is important to note that the proficiency questions are the same as those examined previously in Table 40, but that the use questions were more specific.

Table 44
Template for Examining Relationship Between DVS Use and Proficiency

Questions on DVS Use after NET[a] (Section II of survey)	**Questions on DVS Proficiency** (Section III of survey)
6a. Used DVS to observe or detect targets	1n. Detect targets from reduced exposure position with DVS
6a. Used DVS to engage targets from reduced exposure position	1o. Hit targets at relatively long distances (>150m) using DVS from reduced exposure positions
6a. Used DVS in indirect view to engage targets	1p. Hit targets at relatively long distances (>150m) using DVS from indirect view position

[a] The same questions were asked regarding TWS usage.

Very few individuals indicated they used the DVS in the three modes listed in Table 44. A maximum of 19 leaders indicated they used the DVS in one of the three modes; a maximum of 11 nonleaders indicated they used it. The number of individuals who said they used the DVS to detect targets (a total of 30) was two to three times greater than the number who said they used it to engage targets (10 for reduced exposure, 15 for indirect view). These numbers are in contrast, however, to the 155 individuals who said they did not use the DVS for detection; 173 who did not use it for reduced exposure fire; and 169 who did not use it for indirect view target engagements.

Table 45 presents descriptive statistics on the relationship between DVS use and proficiency for all Soldiers. The patterns in this table are consistent with the response to the

general DVS question presented previously in Table 40, in that nonuse related to the never proficient and proficient in NET ratings, whereas DVS use related to proficient in NET and in the unit.

Table 45
Cross-Tabulation Between Employment of DVS in Unit Training and Proficiency

Type of DVS Usage in Unit Exercises after NET	**Soldier Response**	**% Soldiers: Proficiency**			**# Soldiers**
		Never Proficient	Prof in NET	Prof in Unit	
Target Detection					
	Not Use	37%	45%	18%	155)
	Use	20%	37%	43%	30
Target Engagement with Reduced Exposure Fire					
	Not Use	43%	38%	19%	173
	Use	10%	50%	40%	10
Target Engagement with Indirect View					
	Not Use	38%	43%	19%	169
	Use	27%	40%	33%	15

There are several possible explanations for why only a few individuals used the DVS for target detection and/or target engagement. One reason could be the training they received in NET, which was only familiarization firing; there was no exit criterion for reduced exposure or indirect view firing. Thus Soldiers were not required to achieve a pre-specified level of proficiency during NET, and an objective assessment of proficiency was not recorded. A second reason could be the type of unit exercises conducted after NET. Reduced exposure firing positions are not appropriate in all types of missions and under all conditions. The situations where this technique of fire might be most appropriate may not have been stressed. A third reason could be that the leadership did not stress employment of the DVS. Some of the focus group participants indicated that they became more proficient when the leadership "forced" them to use the LW system capabilities/features.

Discussion of Consolidated Survey, Focus Group, and Training Observation Results

The consolidated surveys and focus groups provided additional and major insights into the adequacy of NET and the training on the LW system that occurred during the follow-on unit exercises. In particular, the consolidated surveys provided data on the extent to which NET and the follow-on unit training each contributed to proficiency. These results confirmed major findings from the training observations but also supplemented these observations. The focus groups provided insights into the rationale for some survey responses, but not all. Patterns and trends in Soldier responses were identified, but could not always be explained with a high degree of confidence.

Analyses of both the use and proficiency questions in the consolidated survey indicated some distinct skill domains underlying the Soldier responses. Given the LW functions that were examined, five domains were identified: interface/interactions with the map displays, messages, weapon subsystem skills (primarily DVS), and planning tools (leaders only). The interface skills related to SA displays, measuring distances, zooming/ panning, and using the overlays that were sent by the chain of command. Typically, voice communications and using the talk/call groups related to the map display functions. It is important to mention that these skill domains were restricted to the questions in the survey. If other tasks had been addressed, then additional skill domains may have been identified. The analyses suggest, however, that employment of the LW system requires multiple sets of skills that must be addressed during training.

A consistent finding from the consolidated survey was that leaders and nonleaders responded differently to the questions about the use of common LW functions and on proficiency with the system. In general, more leaders tended to use these common LW functions during unit training than nonleaders. In addition there were differences among companies on use of the functions. With respect to proficiency, leaders and nonleaders generally disagreed on the stage in training when they became proficient. More nonleaders than leaders tended to say they were never proficient. The nonleaders who indicated they were proficient tended to indicate that their skills were gained during NET; unit training did not contribute substantially to proficiency. On the other hand, more leaders than nonleaders indicated that unit training contributed to their proficiency.

Before discussing possible explanations for these findings, it is important to stress that there was one skill domain for which leader and nonleader responses were consistent. This was the weapon subsystem. For both groups, use of the DVS in unit training was relatively low, and the percentages of Soldiers from both groups reporting they were “never proficient” on DVS tasks were the highest of all tasks. These findings reinforce the conclusions drawn from the training observations - that familiarization firing in NET did not provide the type of training needed for these new marksmanship skills. Soldiers and leaders did not exit NET with a high level of proficiency, and it seems that leaders were unable to provide (or did not provide) the necessary DVS training for their Soldiers nor increase their own skills substantially during the unit phase of training.

A primary question raised by the nonleader and leader differences is why the percentages of nonleaders using the common LW functions during unit training were lower than the corresponding leader percentages. Several hypotheses are offered to explain these results. One explanation is offered by feedback from SMEs who observed the unit training. The unit training was typically very prescriptive and missions were highly rehearsed, which allowed little opportunity for Soldiers to take advantage of the LW capabilities (e.g., they already knew the route, where everyone was going, did not need to communicate, knew the plan, could use the same templates for messages, etc.). Given the limited opportunity for free play and the lack of uncertainty in the mission, the need for LW functions did not come to the forefront. A second explanation is related to the fact that NET training focused primarily on operator skills, and did not progress to the next step of employment training, either individual or collective. Thus leaders were not prepared to design collective exercises that would leverage LW capabilities. Even though leaders might see the potential application of LW capabilities during mission planning and execution and would therefore tryout or work with specific features during unit training, nonleaders, with their more limited military background, could not visualize the same potential and therefore did not use (or tryout) the LW capabilities. Without structured exercises that stressed employment of LW system capabilities, the second- and third-order effects from the LW system were not obvious to those with limited military experience.

Assuming these explanations have some validity, they indicate a need to improve and expand NET beyond what was possible in the nine-day NET that occurred for the Stryker battalion. The expansion should include both individual and collective employment of LW skills, plus leader training and dialogue with unit leaders on how to effectively use the system under different mission and conditions. Support for expansion of the collective phase of NET, with structured exercises emphasizing LW functions, also came from survey responses by Company leaders as a result of their participation in the LUT, where application of LW capabilities/functions was required. Their confidence rose substantially at this point, whereas the confidence of leaders in the other companies, who were executing company situational training exercises during the same time period, did not. In addition, the nonleaders from the LUT company did not use LW systems during the LUT (only team leaders and above had the system), and there was no increase in the percentage of nonleaders who indicated proficiency with the system during the LUT.

Results from the consolidated surveys and focus groups both showed that leader-specific skills should be addressed. Some leaders in the focus groups indicated they should have had more training on LW planning functions. Some mentioned that leaders could learn the system faster than nonleaders. The consolidated survey data showed that leaders who created and modified orders and overlays during unit training indicated they were proficient with overlays; none said they were never proficient. In addition, the survey analyses showed that the leader planning functions represented a distinct set of skill requirements. Detailed analyses of who created and modified orders and overlays as well as what type of orders (FRAGO vs. OPORD) and overlays (operations vs. enemy) were sent implied a need to tailor leader training. In summary, these findings point to a requirement for specific leader training on the planning functions, as well as a separate track for training leaders on these skills in order to better adapt to their duty position responsibilities and rate of learning.

Some leaders in the focus groups commented on the need for additional expertise regarding system maintenance and troubleshooting. Such training would make the unit more self-sufficient and not as dependent on CLS. Responses to questions in the consolidated survey on maintenance did not totally support these statements. However, it is of interest to note that more nonleaders than leaders felt that NET did not prepare them to adequately maintain and troubleshoot the system.

The last point in this section is that the total time required for individuals and units to achieve an acceptable level of proficiency could be shortened if NET were improved and lengthened. Only 15% to 30% of the leaders were confident in the LW skills of individuals within their unit after NET and in their unit's ability to employ the LW system. Four months later, after the CALFEX, these percentages rose to 60% to 75% for the leaders from the two companies that did not participate in the LUT and to 90% for the company leaders who participated in the LUT. These higher percentages (90%) came as a result of LUT, which stressed employment of LW capabilities. With a restructure of NET and the inclusion of well-crafted training exercises, both individual and collective, it is felt that individual and unit proficiency at the end of NET could be raised substantially, thereby reducing potential, additional training loads on the unit and making the unit more self-sufficient quicker.

MOE 2.3.3: Sufficiency of the NET POI – Conclusions

The overall conclusion regarding the EEA NET sufficiency question is that the NET POI was not sufficient. The definition of NET provided in the first section of the report is repeated here to put the assessment of MOE 2.3.3 in perspective.

> NET is defined as training to prepare commanders, leaders, trainers, users, and maintenance personnel during development and fielding of new equipment. It includes training to prepare commanders, staff, and junior leaders to fight with new weapons and equipment (TRADOC Pam 350-37, 2003, p. 76). Further, NET is to accomplish the transfer of knowledge on the operation, maintenance, and DTT (Doctrine and Tactics Training) associated with fielding of new, improved, or displaced equipment from the materiel developer to the tester, trainer, supporter, and user (TRADOC Regulation 350-70, 1999).

In addition, guidance provided in the MOI developed by the US Army Infantry School (USAIS, 2006) stated that the training analysis should provide recommendations for "a NET POI that when executed, successfully trains Soldiers to operate and maintain the system and leaves the unit in a situation where they can conduct sustainment training on the system." (p. 4).

The primary reasons for the conclusion that the NET POI was not sufficient are as follows. Only a subset of the required individual skills and collective tasks was trained. Leader-specific skills were not stressed. Furthermore, Soldier and leader proficiency was tested on only some of skills that were trained. Other critical skills, both individual and collective, were not assessed. Leaders' ratings of their confidence in the proficiency of the individual skills of the Soldiers in their unit and of their unit's collective skills indicated that proficiency was not high immediately after NET. Proficiency was perceived to increase only gradually with the unit training after NET. The most substantial increase in perceived proficiency came with the company that participated in the LW LUT, because it was placed in situations that required employment of LW system features. In essence, the NET POI did not successfully train individuals to operate and maintain the system nor fully enable the unit and its leaders to conduct sustainment training. A restructure of the NET POI should result in higher levels of proficiency after NET.

Primary Strengths and Weaknesses of the NET POI

Below is an outline of the strengths and weaknesses of the NET POI. A detailed discussion of each point follows.

The primary strengths of the NET POI in terms of skills and tasks trained and/or tested were:

- System assembly was trained.
- The basic tasks (skill level 1) necessary to operate the software interface were addressed.
- Soldiers were tested on the basic operator skill level 1 tasks, and portions of system assembly.
- Soldiers were trained on day land navigation using the LW system.

- Soldiers had to boresight and zero the DVS in the two required fields of view.

In terms of NET POI execution, the strengths were:

- The number of instructors for the assembly and software interface training was adequate.
- Small group practice exercises, typically conducted at the squad level, were used during the classroom software interface training.

The primary weakness of the NET POI in terms of skills and tasks not trained and/or tested were:

- Tasks above skill level one, including leader planning skills, with the LW system and the MDSE were not trained adequately.
- The use and employment of the government furnished equipment (GFE) [e.g., the STORM and the TWS] integrated in the system and unique to specific duty positions were not trained adequately.
- Limited to no technical information was presented on some topics such as the STORM, and network/communication structure and functions.
- Only familiarization firing with reduced exposure and indirect view firing was conducted. Scanning techniques were not trained. Both leaders and nonleaders indicated they were not proficient on these tasks (30% to 45%).
- Soldier proficiency with reduced exposure and indirect view scanning and firing techniques was not formally assessed.
- Training on troubleshooting was limited and did not provide sufficient skills, resulting in a heavy dependency on CLS.
- Exercises that trained individuals to employ the system were limited. The focus was on system operation only.
- System employment exercises to develop unit skills were limited. Collective exercises were not structured to stress use of LW features / capabilities. Collective exercises were short and did not exercise the logistical system. Collective exercises did not progress systematically from squad, to platoon, to company.
- No individual night land navigation training was conducted.
- Soldiers lacked some prerequisite skills, but there was no provision in the POI to remedy these weaknesses.
- No collective training was conducted at night.
- Tasks above skill level one were not tested.
- Collective tasks were not assessed.
- Leaders' perceptions of their Soldiers' and units' proficiency with the LW system after NET were relatively low.
- There were differences leader and nonleader perceptions of their own LW skills. Nonleaders (20% to 45%) indicated they were never proficient on 14 of the 17 common LW tasks and skills at the conclusion of NET and unit training. On the other hand, similar percentages of leaders indicated they were never proficient on only 4 of the 17 tasks. For the other 13 tasks, most leaders (83% to 96%) indicated they were proficient after NET and unit training.

- Nonleader use of many system features during unit exercises after NET was low. Leader use was inconsistent among the three companies.
- Leaders indicated that unit training contributed to proficiency, whereas that was not the case for nonleaders.
- Unit training that following NET had differential impacts. Company leaders who had the LW system during the LUT indicated they gained proficiency during the LUT, and became confident in the ability of individuals to use the LW system and their unit's ability to employ the system during the LUT. However, the other company leaders who did not participate in the LUT, but conducted Company situational training exercises (STXs) instead, did not become more confident in this training phase.

In terms of NET POI execution, the weaknesses were:

- The length of NET was too short to adequately train all required LW tasks and skills, to include individual employment exercises in a field environment prior to collective training, and to adequately train collective skills. In addition there was insufficient time to test all critical individual skills and to assess collective proficiency.
- The small-group practice exercises on system operation, although essential and a positive feature of NET, often resulted in wasted time for most Soldiers and typically repeated what the PI had demonstrated.
- Class size for system assembly and software operation training was too large (company size, approximately 100).
- There was no tailoring of training on the software interface to duty position requirements, specifically leader versus nonleader positions.
- The collective training exercises were led by the unit, not the NET cadre.
- Some training aids/support materials were not user-friendly, complete, or designed for unit sustainment purposes. Additional equipment/devices would enable trainers to observe Soldier interaction with the system software and to provide feedback/coaching during PEs.

Some weaknesses are linked. For example, the large class size inhibited the ability of the instructors to tailor the training to duty position requirements and to adapt in other ways to such requirements. There is no attempt to delineate all such dependencies in this section, but their existence is acknowledged.

The ATEC SER (ATEC, 2007) provided independent confirmation of some of the performance weaknesses cited above. Specifically, these areas were: calibration of the digital compass (STORM), employment of the STORM, scanning and detecting targets with the weapon subsystem, achieving a stable position for reduced exposure firing, and maintaining and troubleshooting the system. In addition, the SER indicated that as Company leaders became more proficient during the LUT, they saw more utility to the LW system. This finding supports the observations in this section that the NET was too short and that collective exercises which leverage LW function are needed in NET.

NET POI Strengths: Rationale and Discussion

The supporting rationale for each point is provided.

Skills and Tasks Trained and Tested

- *System assembly* was trained.

  The first day of NET was devoted to system assembly. Everyone had to assemble each of the three subsystems (body, helmet, and weapon).

- The *basic tasks (skill level 1)* necessary to *operate the software interface* were addressed.

  Approximately 2.5 to 3 days were devoted to skill level 1 tasks involved in operating the software interface. The typical procedure was for the instructor to provide an initial overview of system capabilities. Then each primary function or set of functions was described, and the primary instructor provided a demonstration of the function(s). Upon completion of the demonstration(s), the Soldiers divided into squad-size groups of nine for PEs, led by an assistant instructor, on the functions which had just been demonstrated. These PEs were typically 50 minutes in length. This demonstration-PE sequence was repeated over the course of the 2.5 days until the major functions had been covered.

  The skills covered in this phase of NET were:
  - Operate the SCU
  - Start-up procedures and shut down procedures: power on, log on, and log off
  - Configure the LW system (without navigation)
  - GPS/DRD functions/calibration (navigation calibration)
  - Map functions
  - Plotting and editing of a symbol
  - Digital communications: call for medic, SALUTE, free text
  - Voice communications
  - Operate the WUID
  - Operate the DVS
  - Characteristics and operation of the light and medium TWS
  - Operate the STORM
  - Field functionality test
  - Image editor (basic drawing tasks)
  - MDP management (i.e., download the MDP)
  - Mission planning (i.e., fundamentals of creating an overlay and order on the LW system)

  Some tasks and skills were emphasized and trained in more depth than others, which resulted in differing levels of proficiency across tasks and skills.

- Soldiers were tested on the *basic operator skill level 1 tasks*, and portions of system assembly.

  All testing was hands-on, with two Soldiers tested at a time by a single instructor. The skills in the test were generally representative of the skill level 1 tasks required by the system.

  First-time Go rates were very high for all three companies (88 - 96%), but the skills tested were not difficult, nor did the test require Soldiers to apply skills to new situations (see Annex C).

- Soldiers were trained on *day land navigation* using the LW system.

  Soldiers had to plot four (4) predesignated coordinates on a land navigation course, and then successfully find each point. No time constraint was applied. The course was conducted in relatively open terrain, which did not present any great challenges.

  Successfully completing the day land navigation course was not an exit criterion for NET.

- Soldiers had to *boresight and zero* the DVS in the two required fields of view.

  Boresighting and zeroing were conducted by all Soldiers. This required one day to complete.

Execution of the POI

- The *number of instructors* for the assembly and software interface training was adequate.

  The ratio of instructors to Soldiers was 1 to 9 for the PEs on operating and assembling system. This ratio maintained squad integrity in the classroom phase of training. In addition, there was one PI for the classroom training.

- *Small group practice exercises*, typically conducted at the squad level, were used during the software interface training.

  Small group practice exercises are necessary, given the extensive hands-on nature of the LW tasks. Within each NET, there was approximately twice as much time spent performing PEs than lecture. Despite the total amount of time for PEs, within each PE (typically 50 minutes), each individual used the system for a small portion of time, as the instructor had no means to monitor all individuals simultaneously. The instructor had to check each individual one at a time. Soldiers in the focus groups reported they liked this small-group instructional format.

NET POI Weaknesses: Rationale and Discussion

Individual Skills and Tasks Trained and Tested

- *Tasks above skill level one, including leader planning skills* with the LW system and MDSE were not trained adequately.

  Leader planning skills with the LW system and MDSE were not trained adequately, as shown by the observational data, the focus group interviews, and the consolidated survey results. The NET observations indicated that all of the leaders and nonleaders received the same training regardless of duty position. In particular, all individuals received an overview of the LW features related to planning (creating orders and overlays) which was not sufficient for leaders involved in the planning process. Further, since the MDSE training occurred in the middle of the overlapping NETs for the three companies, not all of the leaders could attend the required training.

  The consolidated survey results showed that the leader and nonleader responses differed for many of the questions reflecting the use of the LW features. Specifically, a greater number of leaders reported that they used the LW features after NET compared to the nonleaders. These findings suggest a need to tailor the training to specific echelons so that the training outcomes are maximized for all individuals.

  Furthermore, the survey results reflecting the leaders' use of planning functions indicated that few leaders used the LW system to create or modify orders (12%-14%) and overlays (22% -29%). These results could be due in part to the lack of training on these functions. However, there are other possible explanations. A detailed analysis of the duty positions typically involved in the planning functions indicated leaders at higher echelons and those in the attached elements created and modified overlays. Orders were typically generated at the company level. Unit SOP could have also influenced the planning processes. Some leaders may have thought that these functions should not be performed with the LW system. It may be that the orders and overlays they received were adequate and subordinate leaders saw no need to change them. Also, in general, not every leader needs to digitally create and/or modify orders and overlays on every mission.

  The focus group results also revealed that some leaders reported that LW system features related to the planning process require specific training beyond basic system operation. They indicated a greater emphasis on how to create doctrinally correct overlays and orders with the LW system is needed in NET. However, the leaders also suggested that only the platoon level and above leadership should receive training on the planning process (not squad and team leaders), as well as specific individuals who support planning such as the RTO. Additionally, a few leaders felt that senior personnel could learn the system faster than nonleaders.

  Leaders were not provided with *technical information* needed at their level. For example, there was no information disseminated regarding the nature of the architecture of the LW network, how and why limited call groups were necessary, the factors that affect

communication range, etc. These factors can impact the unit SOP for call groups and communications. A non-technical explanation of this central component of the LW system is necessary for leaders. As there were frequent communication problems during NET and unit training, such information could have clarified how the network could function more effectively.

Nor were leaders made accountable for insuring that Soldiers performed tasks correctly – such as calibration of the land navigation system or maintaining their equipment. Often these tasks were delegated to the NET team or to CLS.

All these findings support the need for a tailored NET where leaders, as well as individuals with specific duty position skills and tasks, can be trained adequately.

- *How to use and employ the GFE* (STORM and TWS) that was integrated in the system and unique to specific duty positions was not trained adequately.
- *Limited to no technical information* was presented on some topics such as the STORM, and network/communication structure and functions.

The observations indicated that only familiarization training was conducted for the TWS and STORM. This may have been due in part to the limited number of these sights and devices fielded to the battalion. The characteristics of the equipment were introduced in lectures and then the equipment was rotated through the small groups as concurrent training. Although only a limited number of leaders were assigned the STORM and the TWS, all individuals were introduced to these items. There was no follow-on training designed to ensure leaders were proficient on these items of equipment. The leaders assigned the TWS were, however, required to boresight and zero the sight.

A small number of leaders *(n* = 17) across different duty positions reported using the STORM in unit training after NET. Yet it is not known how many STORMs were in the battalion. In addition, no proficiency questions were asked about the STORM in the consolidated survey. However, one leader commented during the focus group that he did not use the digital CFF (integrated with the STORM), primarily because of time requirements and lack of confidence in the accuracy of the STORM.

Per the consolidated survey responses, squad leaders and team leaders (*n* = 21) were the primary users of the TWS in unit training after NET. However, responses to other questions regarding specific applications of the TWS indicated that only one-fourth of these leaders actually employed the TWS to detect and/or engage targets using reduced exposure fire or indirect view fire techniques. These results suggest that the leaders were not adequately trained on the integrated capabilities of the TWS.

Other factors may have contributed to these findings for the TWS and STORM. Unit training exercises may not have stressed employment of these integrated LW capabilities. Leaders may have felt the equipment had little value.

- Soldiers lacked some *prerequisite skills*, but there was no provision in the POI to remedy these weaknesses.

  A repeated problem with training on prototype versions of the LW system has been the failure of some Soldiers to have the necessary prerequisite skills. This problem will not disappear and has negative impacts upon LW NET. The required skills vary with equipment and Soldier position.

  The NET observations indicated that some of the instruction assumed that the Soldiers possessed specific knowledge regarding the reasons why certain LW features would be used. For example, the instructor reviewed how to create an entity report. However, some Soldiers may not know what an entity report is or understand why an entity report should be created. Additionally, some of the field training also assumed that the Soldiers could perform certain tasks such as boresighting. However, the observations showed that some Soldiers needed more instruction than what was provided. Other prerequisite knowledge and skills lacking in some individuals were the operation of the TWS, land navigation skills, and simple graphics. Leaders also need to be proficient on FBCB2, orders, and graphic control measures.

- Only familiarization firing with *reduced exposure and indirect view firing* was conducted. *Scanning techniques* were not trained.
- *Soldier proficiency* with reduced exposure and indirect view scanning and firing techniques was *not assessed.*

  The observations of this training indicated that although the POI allocated almost eight (8) hours for familiarization fire, less time was spent in this period of instruction. For example, one platoon took three hours to complete this event. There was limited to no coaching and mentoring of Soldiers on how to establish a stable position when firing from a reduced exposure posture (behind different types of barricades), and how to switch the FOV quickly and still maintain weapon stability and sight picture.

  The observations also indicated that the Soldiers did not receive feedback on their performance. Performance feedback, in terms of targets hit at each distance and trainer critiques, is a critical component of any marksmanship training program but was not incorporated in NET. The range used for this period of training had automated scoring capability, which could have been used to provide feedback on hits and misses by firing lane and by distance to target.

  Finally, the observations showed that there was no practice on techniques of scanning and switching from one FOV to another. In part, the narrow sectors of fire on the range inhibited this type of training, but scanning techniques should be trained in future NET.

  The consolidated survey results indicated that few Soldiers and leaders (15%) used the DVS to detect and engage targets in the unit training after NET. One conclusion from the data is that the nonleaders and leaders may not have used the DVS because they felt that they had not acquired the necessary skills. From 35% to 45% of the nonleaders and leaders felt that they became proficient on target detection and engagement tasks using the DVS in NET. But

similar percentages (33% to 46%) of nonleaders and leaders reported that they never became proficient on these marksmanship tasks. In fact, these tasks received the greatest number of "never achieved proficiency" ratings of all of the LW tasks in the survey (for both leaders and nonleaders). It is important to note that the focus group results suggested that many Soldiers and leaders felt that the DVS should not be used as a lethality tool or employed in close combat (e.g., urban operations). Thus, the Soldiers and leaders may not have had many opportunities during unit training to use it in other ways (e.g., surveillance and reconnaissance).

- Training on *troubleshooting* was limited and did not provide sufficient skills, resulting in a heavy dependency on CLS.

  Observations of NET and the focus group results suggested that troubleshooting was limited to very basic procedures such as unhooking and rehooking cables and powering down the system. If these procedures did not work, then the Soldiers went to CLS for assistance.

  Soldier feedback during the focus groups indicated a need for more training on troubleshooting procedures and a desire to be more self-reliant, as CLS will not always be available (i.e., in combat).

  The survey results showed that a greater percentage of nonleaders than leaders felt they were never proficient at troubleshooting. In addition, the percentage of leaders who felt they became proficient during unit training was twice that for nonleaders. Leaders may have had more experience using and troubleshooting the system during unit exercises, especially the leaders in the LUT, and thus may have been able to provide better assessments of whether additional training improved this particular skill. It should also be noted that the Soldiers and leaders' responses may reflect their proficiency only for the troubleshooting tasks that were available to them (i.e., unplugging cables and powering down the system).

- Exercises that trained *individuals to employ the system* were limited. The focus was on system operation, which could be considered the "crawl" phase of training.

  The primary system employment exercise conducted at the individual level was day land navigation. The majority of the other individual training time focused on operator skills in the classroom setting or a "static" environment. As a result, Soldiers, particularly those with limited military experience, were not fully prepared to operate and employ their systems during collective unit training, since a critical training link, the "walk phase," was absent.

  To clarify this point, examples are provided of the type of structured exercises that could have been included in NET, but were not. There were no exercises that required individuals to send combat-related messages in a field environment at different distances and under different conditions. There were no exercises that required individuals to change call groups in a simulated reaction to loss of a team or squad leader. Soldiers did not have to quickly select a firing location and assume a reduced exposure position given the surrounding terrain features. Soldiers did not have to quickly change SA settings in reaction to a hypothetical change in mission. Soldiers were not required to plot a covered and concealed route using digitized and satellite imagery.

The results from the consolidated survey support the need for incorporating an individual employment phase in NET. A repeated finding was that few nonleaders (below fire team level) indicated they acquired proficiency in unit training; either they became proficient in NET or they were not proficient. In addition, more nonleaders than leaders reported they were never proficient. On the other hand, unit training impacted leaders, as more leaders compared to nonleaders felt that unit training contributed to their proficiency with the LW system.

This difference between leaders and nonleaders probably could have been minimized (and the percentage of nonleaders being proficient with individual skills could have been increased) by providing all Soldiers with more experience and practice via structured system employment exercises in a field environment. Such exercises would provide all individuals the opportunity to more fully integrate LW capabilities into their total repertoire of individual skills.

- *Tasks above skill level one were not tested*.

  The performance test for individual skills focused on basic skill level one tasks, a necessary but not sufficient requirement for an exit test of individual skills. It was not comprehensive, as it did not include skill levels 2 through 4 tasks. For example, the test did not assess leader-specific skills. Leaders were not tested on their ability to calibrate the STORM or on using the order and overlay functions embedded in the LW system in a tactical context. In addition, only simple graphics had to be plotted in the test, not graphics typical of overlays that support an order. The assessment also did not include tasks relevant for specific duty positions. For example, the medics were not tested on the call for medic features and the field artillery personnel were not tested on the call for fire message or fire support overlay.

Collective Tasks and Employment Training and Testing

- *System employment* exercises to develop unit skills *were limited*. Collective exercises did not stress use of LW features / capabilities. During NET, the collective exercises were short and did not exercise the logistical system. Also, the NET collective exercises did not progress systematically from squad, to platoon, to company.

- No training was conducted at *night* during NET.

  The observations of the exercises conducted in NET revealed that the Soldiers were required to progress from individual operator training to relatively large collective, platoon or company, exercises. Prior work with the LW system has shown that it is erroneous to assume that individual skills taught in the classroom automatically translate to individual and collective skills, even squad level skills, in the field. Habits must be changed and the repertoire of skills expanded to enable individuals to leverage LW capabilities. The single platoon-level formation and orders of movement exercise conducted in NET was led by the unit, was short in duration (approximately 2 hours), and was executed during the day. It involved maneuvering the platoon across an open field. Squads were spread out so that they

needed to use the radio to communicate, however, the terrain and daylight conditions allowed visual contact. Thus, since the team members could see each other, they did not rely on the SA or land navigation features of the system. Finally, it did not exercise the logistical system, and the unit was not assessed during this exercise.

The observation of the company-level exercise conducted in NET indicated that the exercise was led by the unit and not the cadre. It also was short in duration (approximately 1½ hours) and conducted during the day. It involved executing a mission in an urban environment. Since the team members were in close proximity, they did not use the radio to communicate. Since it was conducted during the day, the squads did not rely on the SA or land navigation features of the system. The logistical system was not exercised. The unit was not assessed during this exercise.

The benefits of collective training that stressed the LW functions are reflected in the results of the LUT company's leader proficiency ratings after this test, where the focus was on employing the LW system. The percentage of these leaders who indicated confidence in individual and unit employment skills rose by 33% after the LUT. In contrast, the percentage of the other two company leaders who indicated more confidence in the same set of skills rose only 4% as a result of their company exercises. The LUT company leaders were also less likely to report that their unit was never proficient.

The focus group results revealed that some leaders felt that because the battalion leadership forced them to use the LW system during their unit training, they became more proficient with it instead of falling back on what was comfortable for them; they learned its limitations and advantages. In particular, one leader from the company that participated in LUT indicated that the company missions were valuable because he was able to watch the other platoons and could coordinate better because of that type of exercise.

The lack of night training in NET, both individual and collective, is significant as prior experiments with the LW system have shown that the benefits of the LW system are very likely to emerge at night (the Joint Contingency Force Advanced Warfighting Experiment [JCF AWE] in 2000 and the Rapid Fielding Initiative [RFI]- LW comparison conducted in 2004). Participants interviewed after these two experiments (Dyer, 2004; Dyer et al., 2000) frequently gave examples of how the LW system (SA, digital map, overlays, radio communication, integrated TWS) enhanced night operations compared to operating without the LW system. It is noted that use of the HMD at night was a task for which many of the nonleaders (40%) stated they were "never proficient."

- *Collective tasks were not assessed*.

  There was no assessment of collective proficiency in employing the LW system by the unit leaders, the NET cadre, or the proponent. As stated at the beginning of this section, TRADOC Regulation 350-70 states that NET is to include DTT. The NET process should include an assessment of the effectiveness of such training to ensure the goals of NET were achieved.

Execution of the POI

- The *length of NET* was too short to adequately train all required individual LW tasks and skills, including individual employment skills in a field environment prior to collective training, and to adequately train collective skills. In addition there was insufficient time to test all critical individual skills and to assess collective proficiency.

  The conclusion the LW NET was too short follows from the weaknesses cited in this section. In addition, historically, the estimated time requirements from prior analytic work (System Training Plans for LW Block II [USAIS, 2005]; Analysis of alternatives for LW-Block II [Dyer, Centric & Dlubac, 2006]) plus time required for the LW platoon training for the JCF AWE have all indicated that more time is required.

  The observations indicated that the 9-day NET only allocated a half day for individual employment exercises in a field environment prior to collective training (land navigation) and 1.5 days for collective exercises. The short exercises were conducted during the daytime and did not provide Soldiers and leaders with many opportunities to use the features of the system, exercise the logistical system, or practice troubleshooting.

- The *collective training exercises were led by the unit, not the NET cadre*. According to the NET POI and the overall training plan, the NET cadre was to lead the collective exercises during NET. The unit was to conduct additional collective training after NET was complete. The intent behind this plan was that the NET team would develop exercises to stress employment of LW capabilities, and incorporate lessons learned from prior LW training events. Although the unit was to develop SOP and TTP as needed after NET, the exercises conducted by the NET cadre would focus on critical employment concepts and provide a solid foundation for unit TTP development.

  Because the NET cadre could not conduct the unit training during NET in accordance with the original plan, there was no opportunity during NET for leaders and Soldiers to see what "right looked like" at the squad, platoon, or company echelons. Consequently, the collective training led by the unit was inhibited in accomplishing the original training objectives, as the leaders were not adequately prepared for how to integrate the LW system in unit missions. Leaders entered their unit training phase with a minimal foundation on which to develop TTP. The lack of time to provide leader-specific training during NET also meant that dialogues with leaders on possible TTP and employment considerations did not occur. Consequently, the importance of establishing conditions for collective training exercises which leveraged the capabilities of the LW system was not communicated or fully understood during NET.

  SME feedback on unit training observations was that unit exercises were highly scripted and rehearsed, allowing for little opportunity to leverage many of the LW capabilities. Consolidated survey results showed only a gradual increase in the percentage of Soldiers with increased confidence from the squad-platoon-company exercises. The two exceptions to this pattern were the Company leaders why participated the LUT and another company leaders who benefited from the CALFEX.

Also, at the end of NET, only 15% to 30% of the leaders were confident of the individual skills of Soldiers in their unit to operate the LW system and of their unit's ability to employ the LW system. This low percentage indicates that the collective training in the 9-day NET, as executed, was perceived by leaders as not being fully effective, and that the 9-day NET did not provide sufficient time to become proficient in performing LW tasks.

However, reaction by the Company leaders to the LUT experience indicates that appropriately structured training exercises can substantially affect expertise with the system.

- The *small-group practice exercises on system operation* were essential, but resulted in wasted time for most Soldiers and typically repeated what the instructor had demonstrated.

  Within each NET, approximately twice as much time was spent performing PEs than lecture during the classroom phase of NET. However, these exercises provided minimal time-on-task per individual Soldier, which resulted in limited experience performing tasks on the LW system itself. In addition, training was not maximized as the PEs typically repeated what the instructor had demonstrated and required all individuals to practice the skills at one rate (the slowest learner in the group).

  Repetition in the PEs of the same content that was demonstrated during the lecture may have been done to maintain consistency of instruction among the AIs. However, it resulted in much downtime for those who easily learned the skills. That is, some individuals finished the exercise quickly and had to wait unit everyone in the group finished. The AIs did not require the individual who finished early to perform other exercises or tasks. The tendency to only repeat what the PI had demonstrated limited the scope of the tasks and skills. Additional exercises, which increased the difficulty of the task, were not included in the PEs.

  This may explain why some leaders in the focus groups reported there was wasted time in the classroom portion of NET with limited hands-on time even though there was actually twice as much time allocated to hands-on activities than lecture. The exercises needed more variety and challenge. Restructuring of the PEs to allow more hands-on time-on-task per Soldier would have resulted in higher Soldier expertise at the end of NET.

- *Some training aids/support materials* were not user-friendly, complete, or designed for unit sustainment purposes. *Additional equipment/devices* were needed to enable trainers to *observe Soldier interaction* with the system software on the HMD and to *provide feedback/coaching during PEs.*

  The training support materials need to be designed to accomplish two goals. The first is to support the NET training with the NET cadre present. The second is to provide training materials that are designed to be self-sufficient during unit sustainment training and do not require NET cadre for explanation of the material.

  The laminated quick reference guide was user-friendly and useful during NET. But the operator's guide was incomplete, as not all tasks were included, and was not formatted for

easy reference. The PowerPoint slides did not have explanatory notes. The materials provided for unit sustainment purposes (e.g., training materials, guides, exercises, firing tables, performance tests) did not present a rationale or explanation for their use. Leaders received limited to no technical information on the system. The videotape on reduced exposure firing should show only firing positions that have been empirically demonstrated to be stable and effective.

Trainers needed a means of easily monitoring how individuals worked with the interface in order to diagnose problems, to tailor the training, and to provide feedback. If such devices (a handheld display that linked to each Soldier system for classroom or field use) had been available, the hands-on PEs could have been conducted more efficiently and effectively.

- *Class size* for system assembly and software operation training was too large (company size, approximately 100).

The observations of the classroom instruction for the 9-day NET revealed that the company-sized training limited the effectiveness and efficiency of the training. The observers noted that these conditions prevented tailoring the training and the testing (on system operation) to the distinct segments of the target population. On the other hand, observations of the 5-day NET, which was limited to 30 individuals, indicated that the smaller class size and some changes in the execution of the content accounted for less down time throughout the NET. The focus group data also revealed positive Soldier feedback on the small-group PEs.

The training problems associated with a large class size were amplified by the diversity of the target population in these classes, which ranged from privates to battalion staff members. Obviously, there are substantial differences in military experience and knowledge with such a population. With a large class there are limits regarding the extent to which an instructor can attend to individual differences, and it is likely that that largest subgroup will be the focus of attention. Within a company, the largest subgroup is the squad members, and those are the individuals with the least military knowledge and experience. It is very difficult for an instructor to adapt to the individuals with more knowledge and experience, either in terms of content presented or the pace of training.

Impact of MOE 2.3.3 (NET Sufficiency) on MOE 2.3.4 (NET Recommendations)

The NET strengths and weaknesses summarized in this section on MOE 2.3.3 were considered in the development of the recommended NET POI presented in the next section on MOE 2.3.4.

MOE 2.3.4: Recommended NET POIs for Each LW BOI Alternative

This section presents the recommended NET POI for the two LW study alternatives, the rationale for the recommended POIs, and the associated training resources necessary to support NET for a Stryker Brigade Combat Team (SBCT). Training resources were based on the BOIs (which focused on the battalion) as well as the sequencing of the entire NET for a Stryker brigade. Table 49, presented later, shows the layout of the BOIs for the LW system by echelon and duty position in the SBCT for each study alternative. Brief descriptions of the two BOIs are cited below. Although the BOIs presented in these summaries of the alternatives reflect the rifle platoon, the NET assessment addressed battalion through squad training and the recommended training resources pertain to a Stryker Brigade.

- Alternative 1: Base case plus LW down to all Soldiers in the Stryker rifle squad, and SLs and assistant gunners in the Stryker weapons squad. SLs and FOs and the STORM.

- Alternative 2: Base case plus LW down to team leader. SLs and FOs have STORM.

Study Limitations, Assumptions, and Measures of Performance for MOE 2.3.4

Limitations

Two major limitations apply to MOE 2.3.4.

- Recommended changes to the LW NET POI for Alternative 1 were not tested or validated empirically.
- Recommended LW NET POIs for Alternative 2 were not tested or validated empirically.

Assumptions

- Estimates regarding the training impact of the LW system will not be affected greatly by future changes/modifications to the LW system.
- Training resource estimates assume Soldiers and leaders do not possess the necessary requisite skills and knowledge prior to LW training. (*Note.* This is a change from the study plan assumption which stated that requisite skills would exist. It was demonstrated again during NET that frequently Soldiers/leaders do not possess all the requisite skills and knowledge that are necessary to effectively operate and employ the LW system. Thus the assumption was changed and the recommended NET POIs adjusted to accommodate the need for some prerequisite skill training.)
- Recommendations for NET for each LW alternative will be based on the resources needed to successfully train Soldiers and leaders to operate, employ, and maintain the system, and will leave the unit in a situation where it can conduct sustainment training of the system. Recommendations will focus on conducting the necessary training and not constrain NET recommendations to a pre-specified period of time.
- Recommendations for LW NET (all alternatives) will address DTT.

- The BOI for each alternative will be that which has been agreed to by PM-SWAR (Program Manager- Soldier Warrior) and TCM-S (TRADOC Capabilities Manager-Soldier). Each BOI will be the basis determining the number and duty positions of the individuals to be trained.

Measures of Performance (MOP)

The following MOP support the MOE on the optimum NET POI for each study alternative (TRAC, 2006).

- MOP 2.3.4.1. Recommended resources, to include time, instructors, LW systems, facilities, training areas, ranges, training support materials, user guide.
- MOP 2.3.4.2. Recommended individual tasks and skills to be trained, and methods of training.
- MOP 2.3.4.3. Recommended scope of doctrine and tactics training, and methods of training.
- MOP 2.3.4.4. Recommended exit criteria.

Additional Factors Considered in Development of the Recommended NET Strategies

Although additional factors considered in developing the NET strategies were cited in the initial section of the training analysis, they are summarized here to present the overall framework and philosophy underlying the approach that was used. The Army's concept of NET (TRADOC Pam 350-37, 2003, p. 76) was used in developing the recommended NET POIs and associated resources. NET is to prepare commanders, leaders, trainers, users, and maintenance personnel during development and fielding of new equipment. Further, NET is to accomplish the transfer of knowledge on the operation, maintenance, and DTT associated with fielding of new equipment (TRADOC Regulation 350-70, 1999).

In addition, guidance for the NET analysis was given in a MOI from the US Army Infantry School (USAIS, 2006). Specifically, it was stated that the analysis should provide recommendations for "a NET POI that when executed, successfully trains Soldiers to operate and maintain the system and leaves the unit in a situation where they can conduct sustainment training on the system. In developing the optimum NET POI, the focus should be on conducting the necessary training, and not constrain the NET to a pre-specified period of time" (p. 4).

The MOI also stressed the importance of DTT. "LW and MW inherently require DTT in addition to classic NET to maximize the utility of the systems and set the unit up for future collective and mission type training and operations. The unit being assessed will develop tactics, techniques and procedures (TTP) during the [DOTMLPF] assessment; therefore no tactical training was presented [during NET]. Regardless, any development of a new LW/MT NET should address DTT, as the recommended NET POI will be executed for future units" (p. 5).

Consistent with the MOI, an optimum NET POI was viewed as an approach that would lead to a high level of expertise, both individual and collective. As pointed out in the initial section, the Defense Science Board (Braddock & Chatham, 2001) stated that "*Inadequate and poorly timed training can negate the technical superiority of our hardware"* and that "*training*

failure will negate hardware promise" (p. 24). Also the consequences of the failure to assess training were stressed.

Summary of Major Recommendations for the NET POIs

The Structure of NET

- Establish two tracks for individual training. One track, called the leader-digital planner track, is for leaders at the platoon level and above who are responsible for mission planning. This track also includes personnel who support leaders in mission planning. The other track is for individuals at the squad and section echelons, called the squad/section track. The squad/section track also includes collective training and system employment at the small-unit level.

- Reduce class size to no more than 50, preferably platoon size.

- Lengthen NET from 9 days to a total of 19 days for Alternative 1 and to 18 days for Alternative 2. The expanded NET includes 14/15 days of individual training and individual testing followed by 4 days of collective, employment training, starting at the platoon level. Individuals must pass exit criteria in the individual training phase.

Scope of Training and Training Techniques

- In the leader-digital planner track, expand mission planning training, including MDSE training, and add instruction on the LW network architecture/structure and technical information on communication capabilities such as bandwidth.

- Train more individual tasks and skills. Train all tasks and skills to include GFE integrated in the LW system, tasks specific to duty positions, and the necessary prerequisite skills.

- Incorporate multiple, increasingly challenging exercises for individual skills and small-unit tasks. Increase the amount of individual time-on-task, hands-on training during PEs.

- Maintain small-group instruction during the classroom phase of training.

- Train marksmanship skills (reduced exposure firing, indirect view firing, scanning) to a pre-determined level of proficiency.

- Include night exercises for land navigation and collective training.

- Execute cadre-led collective, employment training followed by unit-led training. Conduct platoon exercises first, and then company exercises. Exercises should be sufficiently long to exercise the logistical support system for the LW system.

- Design employment exercises, individual and collective, that leverage the LW functions/capabilities, and show Soldiers and leaders how the LW system can enhance

combat operations.

Exit Criteria for NET

- Expand the exit criteria for individual tasks and skill proficiency. Expand the coverage of skill 1 tasks, and increase the difficulty and complexity of the skills in this test. Test leader tasks. Test duty-specific tasks. Make marksmanship proficiency an exit criterion as well as day and night land navigation proficiency.

- Assess collective proficiency at the squad, platoon, and company echelons. This assessment should be conducted by the proponent for the LW system.

Training Support

- Use a ratio of 1 trainer per 6 Soldiers/leaders.

- Provide each trainer with a hand-held means of monitoring individual performance with the LW system in training areas and during field exercises. Provide monitors for all trainers to enable them to observe individual learning and performance during classroom training.

- The stay-behind training materials should be designed so sustainment training can be conducted with minimal effort. These materials should include technical information on the system, train-the trainer tips, hand-on training exercises, collective employment exercises, and performance tests. For Alternative 2, materials that enable nonleaders to learn the LW system "on their own" should be available to enable these individuals, who do not have the LW system, to assume leader positions. These materials would also facilitate sustainment training under both alternatives.

The following sections provide more detail on the specific NET POI recommendations. They also specify the tasks to be trained. The POIs for each alternative are very similar: total time, skills trained, exit criteria, training sequence, etc. However, the numbers of Soldiers to be trained in each alternative are quite different and impact the required resources. The NET resources for a Stryker Battalion for Alternatives 1 and 2 are presented after the details on the recommended POIs.

The Recommended NET POIs

Background

An important consideration in the development of the NET POIs and resources was the diversity of the LW target population, from private to Battalion commander. This diversity presents training and learning challenges due to the wide differences in the military experience of the Soldiers and leaders who must be trained. Historically, diversity within a rifle platoon has been a training issue with LW prototype systems (Dyer, et al, 2000). This diversity is only exacerbated when the target population is enlarged to a battalion, plus brigade headquarters. To minimize the training problems associated with this diversity, two tracks are recommended. One track is for individuals at the squad and section echelons; the other track for leaders and others at the platoon level and above who are responsible for mission planning. This structural change was necessary to address some of the primary weaknesses identified in the Stryker NET. The two-track NET will allow trainers to tailor the training --- to adapt to differences in skill sets, leSarning rate, assigned equipment, and duty position responsibilities and to conduct more rigorous testing of the skills taught during NET.

It should be noted that the concept of leader and non-leader tracks is not new. In preparation of the JCF AWE, the LW leaders (fire team and above) received an additional week of leader training. Historically, LW System Training Plans (STRAPs) have specified additional training time for leaders, and unique leader training (USAIS, 2005). In the LW Block II Training Analysis of Alternatives (AoA) (Dyer et al., 2006) it was recognized that leaders needed some specific training related to their duty positions.

Also central to the development of the recommended NET POIs were the tasks and skills to be trained, and the level of individual and unit proficiency desired at the end of NET. Both factors were critical, as a major goal of the NET process is to bring a unit to a level where it is self-sufficient regarding system operation, employment and maintenance, and can conduct sustainment training rather than being dependent on the expertise of the system developers. In order to train all required individual tasks, to incorporate doctrine and tactics training, and to achieve the desired levels of individual and unit proficiency the length of NET had to be increased.

In addition, the NET plan was designed to retain the positive features that characterized the NET that was conducted with the Stryker Battalion in 2006. But additional training and different training techniques were recommended to minimize problems and weaknesses associated with the Stryker NET. Specifically, although the system is not hard to learn and the interface is user-friendly, the concept of “one-trial learning” does not apply, as there are many tasks to master and there are different ways that tasks can be performed. The estimated time for the proposed NET is four (4) weeks. The additional time will ensure Soldiers and leaders have the necessary opportunities to use and to become proficient with the system. It also allows for the inclusion of DTT via collective exercises at the squad, platoon and company echelons that stress the features of the system and exercise the logistical system.

Recommended POIs for Each Alternative

The recommended POI for Alternative 1 is in Table 46, and the recommended POI for Alternative 2 is in Table 47. The sequence of training in the two individual training tracks is shown in these tables as well as the collective training at the end of NET. The two individual tracks are the same length and are conducted simultaneously. Integrated collective training at the platoon and company levels follows the two tracks.

It is important to repeat that the leader digital-planner track includes not only leaders at the platoon level and above who are involved in the mission planning process and who must use the MDSE, but also individuals who are likely to support leaders in the planning process. Squad and team leaders are in the squad/section track. With Alternative 1, this means that squad integrity is maintained throughout the LW training. With Alternative 2, "squad" integrity is maintained for the fire team and squad leader positions.

As shown in Tables 46 and 47, the two NET POIs do not differ greatly. In fact, the POI for the leader digital-planner track is the same for both alternatives. The NET for Alternative 1 has 15 days for the squad/section track, while the same track has 14 days for Alternative 2. The difference is because Alternative 1 includes all Soldiers; Alternative 2 includes team leaders and above. It was expected that the training could be conducted in a shorter period of time because of the higher experience level of the individuals in the squad/section track in Alternative 2.

The POIs were designed so the leader digital-planner tracks and the squad/section tracks are conducted simultaneously and completed at the same time. Then the two tracks merge and progress to the employment, collective training phase at the platoon and company levels. Squad and fire team exercises are incorporated in the squad/section track. The leader-digital planner track includes planning skills and tasks, which are not in the squad/section track.

Of importance is that many parts of the recommended POIs are independently supported by the LW SER (ATEC, 2007). The SER was received after the NET POIs had been developed and reviewed by the TCM-S. Each area mentioned as a performance weakness or a training need in the SER had been addressed in the recommended POIs. Areas mentioned in the SER that needed additional training were: calibration of the digital compass, scanning and detecting targets with the weapon subsystem, achieving a stable position of a hasty reduced exposure firing position, employment of the STORM, and more expertise in maintaining and troubleshooting the system. Each area was addressed in the recommended POIs. In addition, the SER indicated that as company leaders became more proficient during the LUT they saw more utility to the LW system. This supports the increased time for collective training in the recommended POIs.

Table 46
Recommended NET POI for Alternative 1

Alternative 1			
Squad/ Section Track	**Content**	**Leader-Digital Planner Track**	**Content**
Day 1	• System assembly; Don and Log-on	Day 1	• System assembly, Don & Log-on • Start System Operation
Day 2 Day 3	• Operate – core topics: *Load MDP; Configure system; Change system configurations; Structure of the software interface; Messages – types, sending, receiving; use of maps and map functions; basic use of symbols, drawing basic graphics (e.g., route); selecting/viewing/ interpreting overlays; introduction to weapon subsystem* • Troubleshoot; system checks, field functionality test • SLs & TLs need additional instruction on receiving/viewing/interpreting orders; modifying overlays • Specific individuals need training on STORM and TWS	Day 2 Day 3	• Operate - core topics *Load MDP; Configure system; Change system configurations; Structure of the software interface; Messages – types, sending, receiving; use of maps and map functions; basic use of symbols, drawing basic graphics (e.g., route); selecting/viewing/ interpreting overlays; introduction to weapon subsystem* • Troubleshoot, system checks, field functionality test • Specific individuals need training on STORM • Network structure, Advanced commo instruction
Day 4	• Day land navigation (Go/NoGo) • Night land navigation (Go/No Go)	Day 4	• Prerequisite skill training/ diagnostics • Advanced/follow-on operator training
Day 5	• Prerequisite skill training/diagnostics • Advanced/follow-on operator training	Day 5	• MDSE (day 1) • Night land navigation (Go/No Go)
Day 6	• Boresight and Zero	Day 6	• MDSE continued

Alternative 1			
Squad/ Section Track	**Content**	**Leader-Digital Planner Track**	**Content**
Day 7	• Scanning and Reduced exposure fire training (day & night)	Day 7 Day 8	• MDSE continued • Planning process with LW system (Orders, Overlays, MDP)
Day 8	• Reduced exposure fire training and testing (day & night)		
Day 9	• Reduced exposure firing testing (day & night)	Day 9[a]	• Boresight/Zero and Scanning training
Day 10	• Individual employment basics to include troubleshooting (day and night)	Day 10[a]	• Reduced exposure firing and test (day and night)
Day 11	• Individual employment basics (day and night) cont'd	Day 11	• Reduced exposure cont'd • Start individual employment basics (day & night)
Day 12	• Squad and fire team exercises (day and night) w/ Stryker	Day 12	• Employment basics continued (day & night)
Day 13	• Squad and fire team exercises (day and night) w/ Stryker	Day 13	• Reinforcement/retraining (actual day in POI is dependent on leader status)
Day 14	• Reinforcement/retraining (actual day in POI is dependent on Soldier status)	Day 14	• Individual testing, to include duty specific testing
Day 15	• Individual testing, to include duty specific testing		
All Soldiers and Leaders			
Day 16 Day 17 Day 18 Day 19	• Platoon and Company exercises (to include Strykers and night exercises) Cadre led followed by Unit led • AARs • Capstone Exercise		

Note. Prerequisite skill requirements differ for the two tracks. For example, Squad/Section track needs weapon/device skills, night observation devices for some, messages, simple graphics. Leader-Digital Planner track needs FBCB2, orders, graphic control measures.

[a] Marksmanship exit criteria for the Leader-Digital Planner and Squad/Section tracks differ.

Table 47
Recommended NET for Alternative 2

Alternative 2			
Squad/ Section Track	**Content**	**Leader-Digital Planner Track**	**Content**
Day 1	• System assembly; Don and Log-on	Day 1	• System assembly, Don & Log-on • Start System Operation
Day 2 Day 3	• Operate – core topics: *Load MDP; Configure system; Change system configurations; Structure of the software interface; Messages – types, sending, receiving; use of maps and map functions; basic use of symbols, drawing basic graphics (e.g., route); selecting/viewing/ interpreting overlays; introduction to weapon subsystem* • Troubleshoot; system checks, field functionality test • SLs & TLs need additional instruction on receiving/viewing/interpreting orders; modifying overlays • Specific individuals need training on STORM and TWS	Day 2 Day 3	• Operate - core topics *Load MDP; Configure system; Change system configurations; Structure of the software interface; Messages – types, sending, receiving; use of maps and map functions; basic use of symbols, drawing basic graphics (e.g., route); selecting/viewing/ interpreting overlays; introduction to weapon subsystem* • Troubleshoot, system checks, field functionality test • Specific individuals need training on STORM • Network structure, Advanced commo instruction
Day 4	• Day land navigation (Go/NoGo) • Night land navigation (Go/No Go)	Day 4	• Prerequisite skill training/ diagnostics • Advanced/follow-on operator training
Day 5	• Prerequisite skill training/diagnostics • Advanced/follow-on operator training	Day 5	• MDSE (day 1) • Night land navigation (Go/No Go)
Day 6	• Boresight and Zero	Day 6	• MDSE continued

Alternative 2			
Squad/ Section Track	**Content**	**Leader-Digital Planner Track**	**Content**
Day 7	• Scanning and Reduced exposure fire training	Day 7 Day 8	• MDSE continued; • Planning process with LW system (Orders, Overlays, MDP)
Day 8	• Reduced exposure fire testing		
Day 9	• Individual employment basics to include troubleshooting (day and night)	Day 9[b]	• Boresight/Zero and Scanning training
Day 10	• Individual employment basics (day and night) cont'd	Day 10[b]	• Reduced exposure firing and test
Day 11[a]	• Squad and fire team exercises (day and night) w/ Stryker	Day 11	• Reduced exposure cont'd • Start individual employment basics (day & night)
Day 12[a]	• Squad and fire team exercises (day and night) w/ Stryker	Day 12	• Employment basics continued (day & night)
Day 13	• Reinforcement/retraining (actual day in POI is dependent on Soldier status)	Day 13	• Reinforcement/retraining (actual day in POI is dependent on leader status)
Day 14	• Individual testing, to include duty specific testing	Day 14	• Individual testing, to include duty specific testing
All Soldiers and Leaders			
Day 15 Day 16 Day 17	• Platoon and Company exercises (to include Strykers and night exercises) Cadre led followed by Unit led • AARs		
Day 18	• Capstone Exercise		

Note. Prerequisite skill requirements differ for the two tracks. For example, Squad/Section track needs weapon/device skills, night observation devices for some, messages, simple graphics. Leader-Digital Planner track needs FBCB2, orders, graphic control measures.

[a] For Alternative 2, the entire squad/section is present for collective training. This includes all unit members without a LW system. SL, TL, and section leaders need to work with their units with equipment as assigned.

[b] Marksmanship exit criteria for Leader-Digital Planner and Squad/Section tracks differ.

Individual Tasks and Skills to Train: Details, Rationale, and Discussion

Individual tasks and skills and methods of training. In this section are listed core individual tasks and skills recommended for NET, and a description of the scope of the associated training. Recommendations regarding methods of training are cited in a series of tables that present related tasks and skills. In addition, exit criteria related to individual tasks are presented. Comparisons of the required tasks and scope to what was accomplished in the Stryker NET are inserted. Throughout this section, the phrase "Stryker NET" refers to the NET conducted with the Stryker Battalion in the summer of 2006. Distinctions are made between the tasks required of the individuals in the squad/section track and the leader-digital planner track.

System assembly. There is a set of skills related to assembly, donning and doffing of the system.

System Assembly and Donning/Doffing Tasks	POI Recommendations
Assemble each LW subsystem (helmet, weapon, and body) Scope: Training must account for the variations in weapons and weapon devices assigned to different duty positions. For example, some leaders have the STORM; some individuals carry the M249, not the M4 carbine.	Recommend minor modifications. Components should not be pre-assembled for this training so individuals completely understand cable connections, etc. This will assist them later in troubleshooting and maintaining the system.
Don the system Scope: Adjust as needed for comfort, fit, and ease of use.	No changes from Stryker NET
Emergency doff the system	Add task to recommended NET as this task was not covered in Stryker NET
Conduct start-up and shutdown procedures	No changes from Stryker NET

Operate the system. A major part of NET involves training individuals on the software interface and the two control devices (SCU and WUID) that individuals use to interact with the software. The scope of this training in the recommended POIs is more than "switchology" training, as it also includes hands-on employment exercises designed to train Soldiers to apply the LW functions in the context of an operational mission. The NET POI recommendations in this section on system operation also focus on having Soldiers perform variations of each task in PEs to gain proficiency, not just repeat what was demonstrated by the trainer.

In addition, it is recommended that the trainers have a hand-held display or similar device, and a monitor or similar device to allow them to view Soldier interactions with the LW software interface. The handheld display should be portable so it can be used outside in a training area and during field training exercises. The monitor is for the classroom environment. Both devices will make training more efficient and effective.

Configuration Tasks	POI Recommendations
Configure the LW system by using the configuration menu. Scope: 10 functions on the menu: visual and audible alerts, filter friendly SA, STORM, routes/waypoints, talk buttons, sight device (i.e., DVS reticle), digital messages, radio, SCU (for left-handed individuals), and time. Each could be considered a separate task.	Train all 10 configurations; add STORM and routes/waypoints as these features were not available in Stryker NET. Add application, hands-on exercises for the configuration tasks, so Soldiers/leaders can determine which configuration settings are best for different missions and conditions, and are able to change the configuration settings appropriately.
Configure navigation system Navigation system configuration procedures are not accessed via the configuration menu, but through one of the main tool bars in the software.	Enhance the Stryker NET to stress the importance of precise navigation calibration. Also, leaders (not instructors) must be responsible for determining true-north by using map and compass, which is necessary for calibrating the DRD. Provide a means for checking the accuracy of DRD calibration. Provide information on the inaccuracies that result if the DRD calibration is not done properly.

One set of skills includes insuring individuals are expert in using the devices that interface with the LW software. They must also understand the structure of the software interface, as all menus and icons are not constantly visible. An understanding of the interface structure will enable them to locate key functions quickly and when they forget the exact procedures.

Skills that Support Interaction with the Software Interface	POI Recommendations
Use the SCU controls Use SCU to access menus and icons on the software interface (a general skill), activate voice functions, call for medic).	Same as Stryker NET.
Use WUID controls Switch to desired operational mode (voice, DVS or TWS, and map display).	Same as Stryker NET,
Knowledge: Understand the software interface structure	Add instruction on the structure of the software interface and its organization, to include which toolbars are always present; the embedded functions on each toolbar, and toolbars that are optional or those that appear only when certain menu selections are made. Individuals also need to understand the multiple means of accessing the same functions and should practice these techniques.

A major LW function is SA. Soldiers must be proficient in using the multiple capabilities that exist with this function.

Situation Awareness (SA)	POI Recommendations
Establish SA settings Although establishing filter friendly SA settings is a configuration task, the application of the task involves determining when the SA settings should be changed from the default setting and extensive hands-on practice to ensure the skills involved in changing these settings are mastered and retained.	Expand NET to include hands-on practice in changing SA settings, and exposure to conditions and situations where settings might need to be changed (e.g., loss of unit personnel, change in mission role).
Display different SA settings Techniques for reducing map clutter with the SA display need to be covered. In addition, the LW software allows individuals to turn SA settings on and off.	Expand NET to include exercises that provide individuals experience in techniques for reducing map clutter from individual SA symbols. Add practice in turning SA settings on and off.

A primary advantage of the LW system is that Soldiers know where they and others are located "on a map," whether it is a digitized map or overhead imagery. In addition, through the application of some basic symbols to this map, they can create simple graphics to help them navigate, to coordinate their movement, to link-up, etc.

Basic Map Tasks	POI Recommendations
Use basic map functions Scope: Access different maps (digitized and overhead imagery), different map resolutions, pan, zoom in/out, etc.	Same as Stryker NET
Plot common symbols to generate a graphic/overlay (e.g., route, checkpoints) Plotting common symbols does not refer to generating doctrinally approved overlays that leaders use in mission planning. It covers the basic functions associated with plotting symbols with which most Soldiers are familiar such as waypoints, check points, and routes. These basic functions are the ability to modify, move, delete, and label symbols, and to draw multi-point symbols. It includes saving symbols in the form of an overlay and transmitting the overlay. Plotting skills also involves the ability to effectively use the symbol menu system to find common symbols (graphic control measures).	Expand NET to include more hands-on exercises to enable individuals to become more proficient in all aspects of this task. Exercises should also be done in field environments where combat-related conditions can be simulated that require Soldiers to perform map tasks.

Given that LW systems are linked via a network, there are many skills, tasks, and knowledge requirements associated with this architecture. Fortunately, many skills are similar to those used with commercial off-the-shelf e-mail systems. However, Soldiers using the LW system must also have military knowledge and experience to take advantage of these capabilities.

Message Skills and Tasks	POI Recommendations
Generate and send digital messages Scope: The four messages included in the LW system used in the Stryker NET were call for medic, SALUTE, free text, and call for fire. The scope of this task includes completing all the appropriate menu fields in each message, setting default recipients, changing recipients, saving draft messages, using the different means of creating and sending messages (e.g., message menu, double click on map), setting message priority, etc.	Maintain the core training on these skills as was done in Stryker NET. Ensure all fields within each message are trained and Soldiers understand the menu selections available. Each Soldier should create and send each type of message (only one message required in Stryker NET). Each Soldier should be required to change message recipients. Expand the hands-on message PEs to incorporate combat-like situations where individuals must assess the combat situation and what information to send, and determine which unit members should be the recipient (default recipients or different individuals). Incorporate repeated exercises to ensure all aspects of creating and sending the four messages are acquired. Any unique procedures associated with a message must be trained, for example, the call for medic message uses specific SCU controls.
Use LW system e-mail features Scope: At a minimum this includes accessing messages that have been sent, opening a message, saving it, deleting it, determining which messages have the highest priority in the inbox, and determining when messages have been received (audible and visual signals).	Expand NET to include more hands-on communication exercises to enable individuals to become more proficient in all aspects of this task.

As indicated in the consolidated surveys, individuals used the voice communications frequently and generally indicated they were proficient with this LW capability. Also Soldiers frequently used voice communications during NET.

Voice Communications	POI Recommendations
Send and receive voice messages	Maintain the core training on these skills as was done in Stryker NET. Add to the leader-digital planner track technical information on the network such as bandwidth limitations, explanations of how call groups are structured and why, and factors that can degrade voice communication.
Establish and change talk groups The configuration menu is where the talk groups are initially established. However, PEs	Expand NET to include more hands-on communication exercises to enable individuals to become more proficient in changing talk groups and

Voice Communications	POI Recommendations
are needed to ensure proficiency in working with all aspects of this task.	be familiar with the combat conditions under which changes might be needed.

A feature that was not fully implemented in the LW system for the Stryker NET was the capability to capture images (static) with the DVS and the TWS, edit them by inserting labels and other annotations, and then incorporate them in a message format to send to other unit members. During the NET, only a brief demonstration on how to annotate an image was given.

Capture, Edit and Send Digital Images	POI Recommendations
Capture, edit and send DVS images	Add training on this task to both tracks. Include hands-on PEs that allow individuals to make decisions regarding whether an image should be sent. Exercises could also involve an assessment and discussion of the value of annotations and labels to potential recipients.
Capture edit, and send TWS images.	Add training on this task only for the individuals who are assigned the TWS. Scope of training should be similar to DVS training. In addition, there may be a need for specific labels to clarify the thermal image for recipients who are not familiar with thermal signatures.

A key feature of the LW system is the embedded GPS, which has been shown to improve Soldier and unit land navigation and movement. Responses from the focus groups indicated that Soldiers tended to depend on the HMD while moving as opposed to using it as an aide. In addition, the proficiency ratings regarding using the HMD for night navigation after NET were low, indicating a need for night training.

Navigate tasks	POI Recommendations
Navigate from point to point during the day Scope: Includes configuring the navigation subsystem, plotting waypoints, and determining the desired route(s) to plot.	Execute day navigation for squad/section track only. PEs for land navigation skills should enable Soldiers to use the waypoint symbols on the map display as a navigation aid, instead of being highly dependent on it. In addition, the PEs should be expanded to have Soldiers plan their own routes, instead of relying totally on instructor-provided waypoints.
Navigate from point to point at night. Scope. Same as day navigation but this variation of the navigation tasks includes using NODs simultaneously with the HMD. This task also involves maintaining light discipline (light can emanate from both the HMD display and the NODs).	Add night land navigation for both tracks.

Integration of the STORM in the LW system enables specific leaders to laze to targets and have the target location automatically included in messages such as SALUTE and call for fire. It can also be employed to determine range to targets and other entities of interest, used as an infrared (IR) aiming light, as a day pointer, etc. It was not fully integrated in the LW system. Equipment operation and employment training was limited in NET.

STORM Tasks – Leaders only	POI Recommendations
Calibrate the STORM Scope: Calibration exercises should include both 4 point and 12 point calibration.	Train only leaders who are assigned the STORM, regardless of track. Expand Stryker NET training to incorporate PEs that assess whether leaders are obtaining accurate readings when lazing, against pre-surveyed locations. Include information on when to re-calibrate, and conditions required for accurate calibration.
Employ the STORM Scope. Includes using the STORM in conjunction with digital messages such as call for fire.	Train only leaders who are assigned the STORM, regardless of track. Add realistic employment exercises to NET, where the STORM is used as an integrated, not an independent, device. Leaders should laze a target, determine distance, incorporate target location in messages, and send message up the chain of command.

Marksmanship tasks. Everyone has a DVS and must receive training on it. Only squad/team leaders have the TWS. The intent in the recommended POI is to ensure Soldiers are proficient on these tasks. As indicated in the consolidated surveys, the DVS was not used frequently, and many (above 30%) Soldiers and leaders felt they were not proficient on the marksmanship tasks, which involved new techniques of fire. Major changes to marksmanship firing tasks and training procedures are recommended for training reduced exposure firing techniques from both defensive and hasty attack positions. However, it is recommended that leader training be from defensive positions only.

All live-fire with new optics and techniques of fire should involve coaching, feedback on hit performance by target distance, and require individuals to achieve a pre-determined level of proficiency. Automated records of individual performance should be maintained to enable NET instructors to diagnose a firer's strengths and weaknesses. Familiarization fire, which was conducted in the Stryker NET, should not be executed as it does not include these critical training techniques, nor does it enable individuals to know their firing strengths and weaknesses. Further, trainers can not diagnose shooting problems and individuals may acquire bad firing techniques.

A video on reduced exposure firing was shown during the Stryker NET. However, it should be edited to show only stable defensive and hasty attack positions; all unstable positions

should be removed. Any position shown should be backed up by empirical data that indicate the probability of hit at ranges from 100 to 200 meters.

DVS Marksmanship-Related Tasks/Skills	POI Recommendations
Change reticle settings on the DVS for both FOVs	Maintain Stryker NET training
Boresight the DVS in both FOV	Maintain Stryker NET training
Zero the DVS in both FOV	Maintain Stryker NET training Add instruction for leaders on DVS zero adjustments at 25 meters to they can train their Soldiers and be in charge of zeroing after NET is completed.
Scan and detect targets with the DVS.	Add training on scanning and target detection to the NET POI. This should include changing FOV and acquiring both stationary and moving targets.
Engage targets out to effective range of weapon system with DVS from reduced exposure firing positions (defensive and hasty)	Replace familiarization firing conducted in Stryker NET with the following. Incorporate coaching on firing from both hasty and defensive firing positions, starting with dry fire, then known distance firing, and progressing to pop-up target scenarios. Training should include how to establish stable firing positions. Provide feedback to each Soldier on target hits and misses by distance to target. Incorporate proficiency gates before allowing a Soldier to progress to a more difficult course of fire. Incorporate a sling, as necessary, in hasty firing position training to provide a stable position. Squad-section track – fire from hasty and defensive reduced exposure positions. Automatic riflemen fire from defensive positions only (Alternative 1). Leader track - fire from defensive positions only.
Hit targets out to effective range of weapon with DVS from indirect view firing positions	Modify Stryker NET training to incorporate feedback to each Soldier on target hits and misses by distance to each target. Add proficiency gates before allowing a Soldier to progress to a more difficult course of fire. Indirect view firing is in squad/section track only.

Only squad and team leaders who have the TWS need to receive marksmanship training. The tasks are basically the same as those with the DVS. However, only firing from a defensive position is recommended, consistent with findings by Dyer et al. (2005).

TWS Marksmanship-Related Tasks/Skills (Only for individuals with the TWS)	POI Recommendations
Change reticle settings on the TWS	Maintain Stryker NET training
Boresight the TWS in both FOV	Maintain Stryker NET training
Zero the TWS in both FOV	Maintain Stryker NET training Add instruction for leaders on TWS zero adjustments at 25 meters so they can train Soldiers and be in charge of zeroing after NET is completed.
Scan and detect targets with TWS	Add training on scanning and target detection at night to the NET POI.
Engage targets out to effective range of weapon system with TWS from reduced exposure firing positions (defensive only)	Include courses of fire and training techniques for the TWS (at night) following the procedures described for the DVS. Incorporate proficiency gates before allowing a Soldier to progress to a more difficult course of fire. Fire from defensive positions only.

Proficiency in operator level maintenance and troubleshooting is critical with the LW system. Individuals in the focus groups indicated they were dependent on CLS. Recommended changes to NET include obtaining more information from the system engineers regarding maintenance and the logic behind troubleshooting. Whenever hands-on training is conducted, the trainers should let the Soldiers attempt to solve the problem rather than immediately stepping in and fixing the problem for them. Leaders may need additional technical information in order to assist their Soldiers after NET.

Maintenance and Troubleshooting Tasks	POI Recommendations
Perform pre-operation system checks on the LW system	Expand Stryker NET Field Functional Test to include other required pre-operations checks. Require pre-operations checks in every hands-on exercise.
Perform operator maintenance on the LW system	Expand Stryker NET training to include additional information regarding operator maintenance on each subsystem, to enable Soldiers to function with greater independence. Clarify what types of problems require CLS.
Troubleshoot the LW system	Expand training on troubleshooting. This will require more technical information on the system and updated procedures to make troubleshooting as quick as possible. Exercise troubleshooting procedures during collective training events.

Previous experiences with LW prototypes have shown that the ability to perform individual skills in a classroom environment does not necessarily lead to the ability to perform them with confidence in a field environment or to an effective integration of multiple skills. A block of cadre-led training should be added that addresses this issue. This type of training should enable Soldiers to more fully understand what it means to "see" other Soldiers electronically, how to leverage the many LW features, and how to employ the system.

Advanced System Skills	POI Recommendations
Apply and integrate LW skills in a field environment, under varying conditions with the Stryker vehicle, to include day/night exercises and troubleshooting. Advanced system skills go beyond what is sometimes called "switchology" skills. Advanced system skills mean that Soldiers and leader are proficient in employing their individual LW skills in a field environment and have integrated these new skills into their repertoire of skills. The intent is to attain a higher level of expertise than that achieved with basic operations taught in the classroom/training area, and to provide smooth transition to the collective training phase.	Add a block of training on system employment to the squad/section track. Exercises should be placed in the context of combat missions. Examples of tasks to be trained/reinforced: - Sending messages to different call groups; at different distances. - Using the SA function to track and maintain awareness of others in the unit. - Practice using different SA filter settings under different conditions. - Determining best routes (e.g., shortest route, covered and concealed route) using digitized maps and overhead imagery. - Practice employing the STORM; exercises that require specified accuracy with the STORM. - Scanning with the DVS and TWS from reduced exposure positions; changing FOV. - Quickly establishing stable reduced exposure firing positions. Trainers should check the degree of exposure and stability of the position. - Squad leader and fire team leader practice in creating overlays and how to use them to the advantage of squad members. - Communicate with the Stryker vehicle through the VIK. - Training on techniques of maintaining light discipline with HMD and NODs at night. - Exercises that enable Soldiers and leaders to adapt to/handle information overload (auditory, visual)

Although overlays can be created via the MDSE, leaders also need to be proficient using the overlay features within the LW system itself. This training is critical in the leader-digital planner track. However, in previous work with the LW system, even squad leaders found the overlays features useful, so some training on overlays is necessary for small-unit leaders in the squad/section track as well. It is likely that overlays will be used frequently; therefore individuals should be skilled in creating and/or modifying them. In addition, it is important to tailor the exercises to the duty positions, as different duty positions are responsible for generating different types of overlays, as was reflected in the analysis of the consolidated survey data.

Assuming future LW systems will be compatible with FBCB2, the MDSE phase of training should include instruction and experience with the interface between the two systems.

Create and Modify Overlays with the LW System (leader-digital planner track only)	POI Recommendations
Create overlays The intent is to place this training in the context of hypothetical combat missions and/or in the context of missions that will be conducted during the collective training phase of NET.	Expand and tailor what was done in Stryker NET. Include more hands-on training on where graphic control symbols are found in the LW symbol menus, as well as how to draw single-point and multi-point symbols. Include training on saving and sending different types of overlays. Leaders should develop at least three different overlays for transmission to others in the class to gain the necessary experience, and receive feedback from their peers on their overlays (amount of detail, sizing of symbols, labeling of symbols, etc.). Tailor the hands-on overlay training to the duty positions of individuals in the class.
Modify overlays Leaders may need to modify an overlay more often than create one.	Expand and tailor what was done in Stryker NET. Include at least three hands-on exercises where overlays must be modified. The overlays should be relevant/tailored to the duty positions of the individuals in the class. Modifications could be formatting changes (size of symbols, labels), correcting the use of incorrect graphic control symbols, etc. All should be put in the context of a combat mission. Overlays could be sent in accordance with the chain of command, modified as appropriate, and then sent back to the respective higher-level leader for review and discussion. Overlays should be sent to others in the class and feedback received.

As with overlays, although orders can be created via the MDSE, leaders also need to develop proficiency using the order features within the LW system itself. This training is critical in the leader-digital planner track. However, even squad leaders may find some orders useful (e.g., FRAGO), so some training on orders is necessary for small-unit leaders in the squad/section track as well. In addition, it is important to tailor the exercises to the duty positions, as different duty positions can be responsible for different parts of an order.

Create and Modify Orders with the LW System (leader-digital planner track only)	POI Recommendations
Create a mission with the LW system	Expand Stryker NET to insure every leader can create a mission on his own at the appropriate echelon. (*Note.* In Stryker NET, a mission had to be on the system in order to create orders and overlays. This may not be a requirement in future versions of the system.)
Create orders (WARNO, OPORD, FRAGO) with the LW system All exercises should be conducted within the context of hypothetical combat missions and/or missions that will be conducted during the collective training phase of NET.	Expand and tailor what was done in Stryker NET. Include more hands-on training on orders and a treatment of which paragraphs of an order are most beneficial for the small-unit. Include training on saving and sending orders. Leaders should develop at least one example of each type of order for transmission others in the class to gain the necessary experience and receive feedback from their peers (clarity, amount of detail, completeness, etc.). Tailor the hands-on order training to the duty positions of individuals in the class.
Modify orders (WARNO, OPORD, FRAGO) with the LW system Leaders may need to modify an order more often than create one; to modify it for their unit.	Expand and tailor what was done in Stryker NET. Include at least three hands-on exercises where orders must be modified. Modifications could be modifying a higher-order order as needed for the leader's echelon, clarifying statements, etc. All orders should be put in the context of a combat mission. Orders should be sent to others in the class and feedback received. As with overlays, orders could be sent in accordance with the chain of command, modified as appropriate, and then sent back to the respective higher-level leader for review and discussion. Exercises should be tailored to the duty positions of the individuals in the class.

Although some MDSE functions, such as creating SAM cards, could be trained before NET with the appropriate target population, it is strongly recommended that the planning features of the MDSE be trained during NET. This is a main reason why NET should be conducted as two individual training tracks. The leaders need at least two days of training using the MDSE to plan, i.e., create orders and overlays. The focus group data showed that leaders felt that they did not receive adequate training on using the MDSE and spent double the amount of

time preparing their orders with the MDSE compared to the time they typically spent planning. Some leaders felt that they did not know all of the features of the MDSE because they did not have time to learn them on their own. Time should be allocated during NET to allow leaders to practice using and become proficient with all of the MDSE functions.

In addition, the focus groups indicated that often nonleader personnel such as the company RTO were delegated certain MDSE tasks. Thus these individuals are included in the leader-digital planner track.

Leaders also need information on the network architecture and bandwidth considerations, and how these features impact the talk groups, fidelity and reliability of the communication network, etc. This block of instruction is included in the table below.

Mission planning and preparation tasks using the MDSE (leader-digital planner track only)	POI Recommendations
Use MDSE for mission planning, to create orders and overlays.	Incorporate MDSE training within the leader-digital planner track. It could also be conducted prior to NET, but due to personnel turbulence and likely unavailability of personnel, it must be integrated in NET as well.
Use MDSE to create SAM cards.	Insure designated individuals within the battalion or company who generate SAM cards are trained and are proficient with this task.
Use MDSE to create a mission data package (MDP)	Add task to leader-digital planner track.
Information on the network architecture, bandwidth considerations; impact of architecture on communication reliability and call group formation.	Add this information to the leader-digital planner track.

All Soldiers need to know how to operate the VIK and perform basic operator maintenance on this item of equipment.

VIK tasks	POI Recommendations
Operate the VIK	Enhance the VIK training; incorporate as a formal part of all operator training
Perform operator maintenance on the VIK	Add task to both tracks.

General Methods of Training Individual Tasks and Skills

Small group PEs. The use of small groups for practice on the assembly and system operation functions that occurred in the Stryker NET should be continued. However, the hands-on exercises conducted within these sessions must be more varied and challenging, and related to hypothetical combat situations. In addition, the PEs within the classroom portion of the POI

should be designed to maximize each individual's hands-on time (time-on-task). Time records obtained during the Stryker NET showed that twice as much time was spent on PEs than on formal instructor presentations. During the PEs, it was often the case that the AI reviewed what the PI stated in the classroom, then each individual typically did one exercise similar to what the PI had demonstrated in the classroom. This format led to "down-time" for each Soldier during a PE rather than facilitating extensive individual practice during the PE. All individuals were required to practice the skills at one rate (the slowest learner in the group). There were no additional exercises for individuals who completed the tasks before everyone else in the group.

Consequently, there needs to be a shift in focus regarding how the PEs are designed and executed, not necessarily an increase in the total POI hours devoted to hands-on training. It is recommended that the individual hands-on time (time-on-task) per individual during each PE be increased by having each individual perform several exercises (3 to 5) that focus on application of the specific skills of interest. The AI can mentor the individuals who need assistance. An associated recommendation is to provide the PI with ample time to explain, demonstrate, and reinforce all the key teaching points prior to the PEs, as Soldiers must understand the new procedures before applying them. This should also reduce the "requirement" for the AI to repeat the PI's instruction during the PE. Thus each Soldier would be working on tasks/skills of increasing difficulty and variety that relate to combat settings, for 45 to 50 minutes of a 60-minute PE, as opposed to the 5 to 10 minutes of hands-on experience observed during the 60-minute PEs of the Stryker NET.

Training support equipment. Training will be more efficient and effective if trainers can easily monitor what a Soldier is doing when he interacts with the software interface. Using only the LW system, the trainer can only observe individual performance after task steps are completed; he is unable to observe how the Soldier performs a task. Trainers need to be able to observe individual performance in the classroom during initial training as well as outside during PEs and during training exercises in the field.

For the classroom environment, it is recommended that monitors be provided for each trainer so the Soldier can link his system to the monitor, thereby enabling the trainer to observe Soldier interactions with the LW interface. For a training area and field environment, each trainer needs some type of hand-held display which he can connect to a Soldier system. Both types of displays were used during training for the JCF AWE in 2000 and were found to be extremely valuable. These training aids enable Soldiers to assist each other, which also facilitates the learning process. The NET instructors also indicated such equipment was needed.

Training support materials. Each Soldier was given a laminated card which contained steps involved in conducting a pre-operations check of the LW system. This type of quick reference check card is recommended for future NET as well.

Soldiers were also given a large Operator's Guide containing black and white PowerPoint Slides and the steps needed to perform most tasks. As indicated by some in the focus groups, the large booklet was not user-friendly. This type of training aid could be made more user-friendly if it was converted into several booklets, each of which focuses on specific tasks/domains. Steps for a task should be on the same page or on the front and back of a single

page. Also more of the steps should be illustrated by image captures of the software in order to communicate more clearly with the new user how each task is performed. Any images of the interface should be in color, as color is a critical cue for many tasks.

Training support materials, to include job aids, should add technical and hard to remember procedural information, as required, for those in the leader-digital planner track (e.g., STORM information, zero adjustments). Leaders should also have a packet of technical information to provide the necessary background on how the LW system works, such as the network architecture.

The videotape of reduced exposure firing should be revised to show only stable reduced exposure firing positions. All positions shown in the video should be verified as stable and effective through live-fire testing. Videos from the perspective of the enemy should be added to show the limited exposure that a firer has from these positions.

New training materials are needed to assist leaders to conduct sustainment training after NET. All PowerPoint slides should contain explanatory notes for the trainer. These notes should stress the important points that need to be made; key points that leaders are likely to forget and are not documented in any of the other training materials (e.g., zero adjustments for the DVS, implications of inaccurate calibration of the DRD or STORM). Any training lessons learned and tips regarding training Solders and units on the LW system that the NET cadre has acquired through repeated iterations of NET and from previous work with the LW system should be consolidated and provided to the leaders. Recommended hands-on training exercises should be included along with the supporting rationale as to why they are needed and how they might be adapted or tailored to the Soldiers being trained. All these materials should be available in hard copy and electronic formats. Marksmanship courses of fire and land navigation exercises should be included. All proficiency measures should be documented.

Prerequisite Tasks and Skills

Historically, training with Soldiers (leaders and nonleaders) using prototypes of the LW system has shown that Soldiers often lack certain prerequisite skills (e.g., Dyer et al., 2000, 2005). Deficiencies have occurred with weapon devices (boresighting, TWS), map reading/navigation (knowledge of 10-digit coordinates, no familiarity with overhead imagery), different types of messages, graphic control measures, orders, and overlays. This was also the case with some individuals in the Stryker NET. When Soldiers do not possess these prerequisites, instructors must take the time from the NET training to develop these skills as progression to the LW tasks cannot be made otherwise.

One option considered for addressing this problem was to incorporate diagnostic testing prior to NET and then have the unit address individual deficiencies. However, another more feasible option was recommended; additional time was incorporated in NET to address this issue. The recommended NET POI includes the equivalent of one day to train these skills as required with individuals who are deficient in certain prerequisite skills. The prerequisite skills can not been identified a priori, as they depend on the Soldiers and leaders participating in NET. The increased time in the recommended NET POIs is designed to provide the NET instructors the

flexibility to adapt to such deficiencies as necessary. A CD-ROM, developed for the LW program, on messages, graphic control symbols, orders, and map reading is available for use during NET (ARI, 2003)

Performance Tests and Exit Criteria for Individual Tasks and Skills

The Stryker NET only tested Soldier performance on basic system operation and assembly tasks. The recommended NET POIs expand the exit criteria beyond these skill level 1 tasks. Remedial training will be conducted when an individual does not pass a particular test. Additional exit criteria are recommended in each of the following areas:

- Additional skill level 1 operator skills such as creating different SA settings and call groups, plotting several different symbols and labeling them, creating a message given a combat situation, selecting different maps, and accessing different overlays and orders.
- Troubleshooting skills.
- Leader planning skills with the MDSE.
- Leader preparation of overlays and orders using the LW system.
- Day and night land navigation course for the squad/section track;
  Night land navigation only for the leader digital-planner track.
- DRD calibration by team leaders and above which includes establishing true North.
- Calibration and accuracy in employing the STORM (leaders with this system).
- Hit targets with the DVS from both hasty and defensive firing positions – squad/section track. (A course of fire and corresponding standard of performance should be established based on prior reduced exposure firing experiments, e.g., for the lethality experiment conducted as part of the DOTMLPF assessment and Dyer et al, 2005.)
- Hit targets with the DVS from defensive firing positions – leader-digital planner track only.
- Hit targets with the TWS from defensive firing positions at night – only individuals who have the TWS.

It is also recommended that leaders be given a written test on their knowledge of the system. Areas to include would be knowledge/understanding of the LW network architecture, the structure of call groups, zeroing adjustment procedures, technical information on the system, logistical procedures, etc.

Doctrine and Tactics Training (DTT)

The collective phase of the recommended NET is really a series of phases: a crawl, walk, run approach. The first collective training phase is built-into the squad/section track and involves individual employment exercises (day/night) followed by squad and fire team exercises (day/night and with the Stryker vehicle). This training occurs in both alternatives. With Alternative 1 all squad members have a system, but in Alternative 2 only team leaders and above have a system. However, the fire-team/squad training in Alternative 2 involves the entire squad as leaders must learn how to function effectively with a squad where only some members have the network, SA, and lethality capabilities associated with the LW system. The next phase of collective training occurs after both individual training tracks have been conducted. This phase

integrates personnel from both tracks. Collective employment training starts at the platoon level, as squads are already proficient. The concept is to have platoon training led by the NET cadre first, followed by unit-led platoon training. The same training cycle (led by NET cadre, then led by unit leaders) is repeated at the company echelon, culminating in a capstone exercise.

Inclusion of DTT in NET is consistent with TRADOC regulations, with guidance received from the Infantry School for the NET assessment, and with previous training observations of units using LW prototypes. Historical data and observations of the LW platoon during train-up for the JCF AWE (Dyer et al, 2000) showed that expertise with many individual skills required field experience, and individual training per se did not automatically translate to unit expertise. Additional time was needed for the unit to determine how to best employ the system both as individuals and as a unit. The LW Stryker NET, as executed, allowed for only one (1) day of any form of collective or employment training. In addition, the training did not progress systematically from squad, to platoon, to company.

The research literature on learning supports this DTT phase of NET. From a learning perspective, effective employment of the LW system means that Soldiers, leaders, and units must change habits and SOP or, at a minimum, gain increased flexibility in how tasks are executed. The LW system offers additional means of accomplishing many tasks. For example, land navigation can still be conducted with a map and compass, with a separate GPS system, or with the LW navigation capabilities. Link-ups can be accomplished via radio and other traditional signals, but can also be accomplished through graphic control measures on a digitized map in conjunction with the SA display/overlay on the LW system. But habits and established procedures are not modified quickly. Soldiers, leaders, and units need practice in becoming proficient with new, alternative techniques, and time to develop unit SOPs which incorporate the LW system. The collective training phase provides some core time to address these challenges.

The consolidated survey data from the leaders in the company in the LUT, support the recommendation to include more collective training in NET that involves systematic use of the LW system. A higher percentage of these leaders rated individual and unit skills as proficient at the end of all training than was the case with leaders from the other two companies. Of particular note was that this increase in perceived proficiency was associated with the LUT itself. This increase was attributed to the fact that the LUT focused on the LW system; individuals had to use it in the test scenarios. Without such requirements, leaders in the other two companies did not perceive an increase in proficiency with company-level training. Another finding that collaborates this interpretation regarding the influence of the LUT was that more of these company leaders indicated their own skills increased during LUT, while the Soldiers in the same company who did not have the LW system did not indicate a corresponding increase during LUT.

In addition, the research literature on diffusion of innovations (Rogers, 2003) is relevant to the DTT phase of NET. The LW system can be considered an “innovation,” in that it integrates technologies that can affect the core of what an Infantryman does – move, shoot and communicate. The diffusion of innovation literature clearly indicates that innovations are adopted at different rates within populations. The rate of adoption is affected by five primary factors: (1) the relative advantage of the innovation as perceived by the individual; (2) the

compatibility or consistency of the innovation with past experiences, needs and norms of potential adopters; (3) the complexity of the innovation; (4) the extent to which the innovation can be experimented with or tried out; and (5) the extent to which the impact of the innovation is visible to others. This literature also shows that there are different categories of adopters: ranging from innovators, early adopters, early majority, late majority, to laggards. It is reasonable to expect that within an Infantry company some individuals will accept the LW system early during NET, while others will take more time and need proof of its value before acceptance.

The literature on innovations has documented techniques that help speed the process of adoption. Some of these techniques are recommended for incorporation in future LW NET, both the collective training phase and the individual phase. The hands-on and field experiences with the LW system should be specifically designed so advantages of the system are evident and visible to all, keeping in mind that the LW system is not designed to enhance all combat functions. When the LW system enables a Soldier or leader in specific duty position to do something that is not consistent with his past training, role, and experiences, exercises should be included that enable this individual as well as others within the unit to see and recognize the benefits of this new capability. The NET cadre should allow time for unit leaders to discuss various SOPs and try them out. Collective exercises and experiences should be carefully designed so individuals and units actually use the system's capabilities as a means of gaining proficiency and increasing acceptance. Employment of the LW system in these scenarios should result in better unit performance than if LW was not available.

Previous data and observations of LW training (references Dyer et al., 2000; 2005) have also shown that units and unit leaders need guidance on how to employ the system and should participate in collective scenarios that "enforce" use/employment of the LW features. This does not mean that the NET cadre should dictate techniques and procedures, but rather that the cadre develop exercises and establish training conditions which enable and facilitate the development of TTP, so Soldiers and leaders gain a better understanding how the LW system could be employed. Use of such LW features as the radio, graphics/overlays to control movement, digital transmission of information, new optics to detect and acquire targets, etc. does not occur automatically on the part of individuals, leaders, or units. Unless such structured exercises are incorporated in the training plan, individuals do not change their habits and tend to function as they have previously. These prior experiences with the LW system have also shown that squad and platoon-level exercises should precede company exercises.

Squad and fire team training. The recommended POIs include squad and fire-team training in the squad-section track. Proficient squads are the cornerstone of platoon proficiency. Because squad integrity is maintained in this track, this training will allow the squad leader the opportunity to ensure his squad can effectively employ the LW system before integration into larger-scale platoon and company exercises. For each alternative, it also provides the leaders the opportunity to develop internal SOPs.

This block of training is important for both BOI alternatives, although it differs for each. With Alternative 1, all Soldiers have the LW system, so the training challenge is to ensure that all squad members understand LW employment concepts and are proficient. The unit being

trained is sufficiently small so that the NET cadre can detect any individual and leader weaknesses that might exist at this point. With Alternative 2 the NET cadre must ensure the squad leaders and fire team leaders gain the necessary skills to have an effective squad where some individuals have the LW system and others do not. The squad must learn how to function effectively as a unit with different technologies within the squad.

Small-unit exercises that demonstrate the usefulness of the LW system during day and night operations and with the Stryker vehicle should be developed for NET. Typical squad tasks can be practiced. However as stressed previously, the key to training success is providing the conditions where LW capabilities enhance the survivability, lethality, and the effectiveness of the squad, as well as ensure squad members use the appropriate LW features. Exercises should allow squads and fire teams to understand and experience when the use of LW capabilities is very beneficial.

Wherever possible, select tasks that are difficult to perform without the LW system, but are made easier to perform or can be executed more proficiently with it. Squads should perform these tasks with and without the system during NET. A good example of such a task was identified during the RFI-LW side-by-side experiment. Night linkup was very easy for the squad when all members were equipped with the LW system (used a graphic showing the link-up point), but was very difficult for the same squad when it did not have the LW system. The squad-level land navigation experiment conducted as part of the DOTMLPF assessment found similar results with a linkup mission. A night link-up would be good exercise for platoon and company training as well.

On the other hand, there are some situations where the LW system does not necessarily add value. For example, using reduced exposure observation techniques to help clear rooms during urban operations has typically not been effective. Soldiers cannot scan a room quickly; there is insufficient light within a room for the DVS to function properly; the barrel of the Soldier's weapon can be detected from others inside the room (see Figure 23); surprise can be difficult to achieve; etc. Other exercises should be used in conjunction with the LW's reduced exposure observation and fire capabilities.

Figure 23. Entering a room: Varying degrees of weapon exposure as viewed from inside of room.

As some squad leaders have the STORM, the squad collective training in the squad/section track allows these leaders to become proficient in employing this system. Other elements to incorporate include night exercises, coordination with the Stryker vehicle crew, exercises that require only radio/digital communications, opportunities for reduced exposure observation and fire, etc. Challenging force-on-force exercises against another squad with LW equipment could be included to enhance the realism of the training.

Squad/section training should also incorporate pre-operation checks, troubleshooting, etc. so these tasks become an integral part of every Soldier's repertoire. The squad/section collection training phase of NET also provides the opportunity for other elements (mortars, medics, snipers, reconnaissance) to conduct collective training, and focus on their specific requirements.

This block of training should conclude with an external evaluation by the system proponent.

Platoon training. Platoon training provides the first opportunity to integrate mission planning into the collective training. Given the squad training that has already occurred, platoon leaders can assume that their squads are proficient both individually and collectively with the LW system. Thus the focus can be on exploiting basic mission planning tools, command and control and employment of the squads, and integrating slice elements as appropriate. The basic concepts regarding the type of training exercises cited above regarding squad training apply here and thus are not repeated. At this stage of NET, the collective exercises should be long enough to exercise the logistical support system.

The initial platoon exercises would be designed and led by the NET-cadre. The exercises should be well-crafted to "force" employment of LW capabilities and to demonstrate where the LW system can improve platoon performance. Then the exercises would be led by the unit platoon leadership which provides them with the opportunity to develop SOPs, and techniques and procedures. Some of the LW skills stressed during platoon missions would involve using digital FRAGOs and overlays, employing the STORM for CFF and SALUTE, conducting night exercises, changing talk groups, experimenting with different SA settings in different conditions and missions to see what works best, etc.

Training for both study alternatives would involve all Soldiers. This includes Soldiers in Alternative 2 who do not have the LW system. As with the squad training for this alternative, the platoon leaders must learn how to command and control their platoons when everyone does not have a LW system. The platoon phase would end with an external assessment by the proponent.

Company training. The company training builds on the platoon training, and as with platoon training, it would be first led by the NET cadre and then by the company leaders. The initial cadre-led structured exercises would facilitate the collective employment of LW features at company level. Some major differences are that mission planning, order and overlays, is now more formal via the MDSE, and more battalion/company elements are now involved (medics, snipers, mortars, etc.). Thus the complexity of the exercises will change in order to effectively integrate all slice elements, and the integration challenges vary accordingly.

Soldiers who have the Stryker Mounted Warrior systems should be integrated into the collective training so leaders can practice maneuvering their squads and platoons as they will when deployed. Again, day and night exercises should be conducted, and the exercises should be long enough to exercise the logistical system. In addition, this training block provides the opportunity for leaders to develop and refine TTP and SOP. As before, this phase allows all individuals to learn the implications of "seeing other Soldiers electronically" on the battlefield during company missions. Force-on-force training, a LW unit against another LW unit, is recommended.

As was the case with the platoon training, this company phase, in both study alternatives, would involve all Soldiers; this includes Soldiers in Alternative 2 who do not have the LW system. Company leaders must learn how to command and control their companies and attached elements when everyone does not have a LW system. The company phase would end with an external assessment by the proponent.

Training Nonleaders in Alternative 2

Every unit experiences personnel turbulence and turnover. For example, nonleaders in a rifle squad may be required to assume a team leader position. This presents several challenges to the unit when everyone does not have a LW system as is the case with Alternative 2. One, these individuals are typically not fully prepared to assume a leader position given their limited military experience. Two, these individuals have not been trained on the LW system. Three, unit leaders must take the time to train these individuals and prepare them for their new responsibilities within the unit as well as train them on the LW system.

The issue addressed in this section is how the NET process can help the unit with this training challenge. It is assumed that no additional LW systems are available. Without additional LW systems, training support materials, aids, and equipment become critical. Well-crafted training materials could reduce the additional training load placed on unit leaders. The previous recommendations in this section of the report on enhancing the training materials the NET team leaves with the unit apply to this situation. In addition to the maximum extent possible, these materials should be designed so nonleaders, wearing a LW system, can work with them to "learn to operate" the system independently of unit leaders. Checks on learning exercises embedded in these materials would enable leaders, using a handheld display, to quickly determine whether nonleaders have gained the proficiency desired.

In addition, the NET stay-behind materials should include critical instructional information on the core leader prerequisite skills and knowledge required by the LW system; skills and knowledge beyond skill level 1. At a minimum, the materials should include information on commonly used graphic control symbols, types of overlays and their purpose, types of orders and the purpose of each, the essential elements of an order, the purpose of each message in the LW system and when it should be used, map reading skills to include 10-digit grid coordinates, and satellite/overhead imagery.

No estimates are made in this report regarding additional resources needed to facilitate this training. However, it is possible that additional LW systems are required, as well as multi-media training packages.

NET Execution Strategy and Resources

The BOIs for each alternative were reviewed, and the individual positions for the leader digital-planner track were identified in conjunction with the training representative from the G3, US Army Infantry School. These leader positions and the corresponding number of individuals did not change in the two alternatives. For each alternative, the duty positions not selected for the leader digital-planner track were designated for the squad/section tracks. Table 48 summarizes these numbers. Table 49 presents the BOIs by study alternative, duty position, and training track.

Table 48
Numbers of Individuals in the Leader-Digital Planner and Squad/Section Tracks for the Alternative NET POIs

Alternative and Echelon	**Leader-Digital Planner**	**Squad/Section**	**Totals**
Alternative 1			
Brigade	47	50	97
Battalion and Company	69	424	493
	(116)	(474)	(590)
Alternative 2			
Brigade	47	45	92
Battalion and Company	69	144	213
	(116)	(189)	(305)

Table 49
Number of Individuals in Each Alternative by Duty Position, and by Leader-Digital Planner and Squad/Section Training Tracks

Duty Position	**Alt 1**	**Alt 2**	**Psn in Ldr-Dig Trk?**	**Group Counts for Tracks**			
				Ldr Dig Trk	**Squad/Section Track**		
					SL / TL	**Other Psn**	**Alt 1 only**
Brigade Level Assets (x1 per SBCT)							
Brigade HQ							
Bde Cdr	1	1	YES	1			
Bde S-2	1	1	YES	1			
Bde S-3	1	1	YES	1			
Bde CSM	1	1	YES	1			
Bde Veh Driver	2	0	NO				2
Bde FS Coord	1	0	NO				1
Bde Fire Spt SPC	1	0	NO				1
Bde RTO	1	0	NO				1
EN Company							
EN Co Cdr	1	1	YES	1			

Duty Position	Alt 1	Alt 2	Psn in Ldr-Dig Trk?	Group Counts for Tracks			
				Ldr Dig Trk	Squad/Section Track		
					SL / TL	Other Psn	Alt 1 only
EN Co YESO	1	1	YES	1			
EN Co 1SG	1	1	YES	1			
EN Platoon (3 per SBCT)							
Engineer Platoon Plt Ldr	3	3	YES	3			
Engineer Platoon PSG	3	3	YES	3			
Engineer Platoon Squad Ldr*	9	9	NO		9		
Engineer Platoon Sappers	18	18	NO			18	
RSTA Squadron							
Sqdn Cdr	1	1	YES	1			
Sqdn S-3	1	1	YES	1			
Sqdn S-2/ISR	1	1	YES	1			
Sqdn XO	1	1	YES	1			
CSM	1	1	YES	1			
RTO	2	2	YES	2			
Reconnaissance Troop (3 per SBCT)							
Trp Cdr	3	3	YES	3			
Trp YESO	3	3	YES	3			
Trp 1SG	3	3	YES	3			
Recce Plt Ldr	9	9	YES		9		
Recce PSG	9	9	YES		9		
Recce Plt Tm Ldr*	9	9	NO			9	
Recce Plt A Tm Ldr	9	9	NO			9	
Subtotals for Bde Elements	**97**	**92**		**29**	**27**	**36**	**5**
Stryker Battalion (3 per SBCT)							
Stryker Battalion							
BN Cdr	1	1	YES	1			
BN YESO	1	1	YES	1			
BN S2	1	1	YES	1			
BN S3	1	1	YES	1			
BN S4	1	1	YES	1			
BN S6	1	1	YES	1			
BN CSM	1	1	YES	1			
BN Veh Dr	1	1	NO			1	
BN RTO	2	2	YES	2			
S2 Section Intel Sgt	1	0	NO				1
S3 Section Ops Sgt	1	0	NO				1
S3 Section Ops Asst	2	0	NO				2
S3 Section Veh Dr	3	0	NO				3
Commo Sec RDO Retrans Op	1	0	NO				1
Commo Sec RDO Retrans Op	3	0	NO				3
Recon Plt HQ Plt Ldr	1	1	YES	1			
Recon Plt HQ PSG	1	1	YES	1			

Duty Position	Alt 1	Alt 2	Psn in Ldr-Dig Trk?	Group Counts for Tracks			
				Ldr Dig Trk	Squad/Section Track		
					SL / TL	Other Psn	Alt 1 only
Recon Plt HQ TM Ldr *	3	3	NO		3		
Recon Plt HQ A. Tm Ldr	3	0	NO				3
Recon Plt HQ Scout / Dr	3	0	NO				3
Recon Plt HQ IAV Dr	4	0	NO				4
FS Element FSO*	1	1	YES	1			
FS Element FS SPC	1	0	NO				1
FS Element RTO	1	0	NO				1
Mortar Plt HQ Plt Ldr	1	1	YES	1			
Mortar Plt HQ PSG	1	1	YES	1			
Mortar Plt HQ Section Ldr	1	1	YES	1			
Mortar Plt HQ Veh Dr/RTO	2	0	NO				2
Mortar Plt HQ FDC	2	2	NO		2		
Mortar Squads Sqd Ldr	4	4	NO		4		
Mortar Squads Gun	4	0	NO				4
Mortar Squads A. Gun	4	0	NO				4
BN Sniper/Squad Sqd Ldr*	1	1	NO		1		
BN Sniper/Squad Sr Sniper	1	0	NO				1
BN Sniper/Squad Sniper	4	2	NO			4	
Trauma SPC/ Combat Medic	12	14	NO			12	
Infantry Company (3 per SBCT)							
Company HQ Co Cdr	3	3	YES	3			
Company HQ Co YESO	3	3	YES	3			
Company HQ Co 1SG	3	3	YES	3			
Company HQ Supply Sgt	3	0	NO				3
Company HQ NBC NCO	3	0	NO				3
Company HQ Armorer	3	0	NO				3
Company HQ RTO	6	6	YES	6			
Company HQ Fwd Sig Spt NCO*	3	3	YES	3			
Sniper Team SR Sniper *	3	3	NO			3	
Sniper Team Sniper	6	0	NO				6
Rifle Plt's Plt Ldr	9	9	YES	9			
Rifle Plt's PSG	9	9	YES	9			
Rifle Plt's RTO	9	9	YES	9			
Rifle Plt's FO*	9	9	YES	9			
Rifle Squads Sqd Ldr *	27	27	NO		27		
Rifle Squads Fire Tm Ldr	54	54	NO		54		
Rifle Squads Auto Rflman	54	0	NO				54
Rifle Squads Gren	54	0	NO				54
Rifle Squads Rflman	54	0	NO				54
Weapons Squad Sqd Ldr *	9	9	NO		9		
Weapons Squad MG	18	0	NO				18
Weapons Squad Ammo Handler	18	0	NO				18
Weapons Squad A. MG	18	18	NO				18

Duty Position	Alt 1	Alt 2	Psn in Ldr-Dig Trk?	Group Counts for Tracks			
				Ldr Dig Trk	Squad/Section Track		
					SL / TL	Other Psn	Alt 1 only
Mortar Section Sec Ldr	3	3	NO		3		
Mortar Section Sqd Ldr	3	3	NO		3		
Mortar Section Gun	6	0	NO				6
Mortar Section Mort Carrier Dr	6	0	NO				6
Mortar Section A. Gun	6	0	NO				6
Mortar Section Ammo Bearer	6	0	NO				6
FIST FIST Ch	3	0	NO				3
FIST FS Sgt	3	0	NO				3
FIST FS SPC	3	0	NO				3
SBCT BN Total	**493**	**213**		**69**	**106**	**20**	**298**
3 SBCT BNs per BCT	**1479**	**639**					
Total Stryker Bns + Bde Elements	**1576**	**731**					

Note * indicates duty position has STORM.

The numbers of individuals to be trained at a given point in time within the squad/section and leader-digital planner tracks were determined. The goal was to keep the "class size" equivalent to the size of a platoon, and not more than 50. As indicated previously in this report, the class size of 100 used in the Stryker NET was too large. It resulted in inefficient training and an inability to tailor training to the target audience. In addition, the goal was to place individuals with similar responsibilities and from similar/same units together. The following leader-digital planner tracks and squad/section tracks for NET were identified.

- Alternative 1
  Brigade:
    1 Leader-Digital Planner Track (47 individuals)
    1 Squad/Section Track (50 individuals)
  Battalion:
    3 Leader-Digital Planner Tracker (23 individuals each, a company plus Bn HQ personnel)
    9 Squad/Section Tracks, 3 tracks from each company (34 individuals each track)
    1 Squad/Section Fire Effects Track (57 individuals)
    1 Squad/Section Sniper/Recon Track (28 individuals)
    1 Squad/Section Bn medics and Bn HQ (33 individuals)

- Alternative 2
  Brigade:
    1 Leader-Digital Planner Track (47 individuals)
    1 Squad/Section Track (45 individuals)
  Battalion
    3 Leader-Digital Planner tracks (23 individuals each, a company plus Bn HQ personnel)
    1 Squad Section, A Co and Fire effects (46 individuals)

1 Squad Section, B Co and recon/snipers (47 individuals)
1 Squad Section, C Co and medics (51 individuals)

Alternative 1 NET Tracks

The following tables cite the duty positions of the individuals assigned to each track and the number of individuals in those tracks.

Table 50
Alternative 1. Brigade Personnel in Leader-Digital Planner Track and Squad/Section Track

Track Name	**Positions**		**#***
Bde Track Leader – Digital Planner	Bn Cdr(1), S2(1), S3(1), CSM (1) = 4 total RSTA Squadron: Cdr(1), S3(1), S2(1), XO (1), CSM(1), RTO(2) = 7 total	Eng Co Cdr(1), XO(1), 1SG(1) = 3 total Eng Plt Ldr(3), PSG(3) = 6 total Recon Trp: Cdr(3), XO (3), 1SGT (3) = 9 total Recce Plt Ldr (9), PSG (9)= 18 total	47
Bde Track – Squad Section	Bde Veh Dvr(2), Bde FS Coord(1), Bde FS Spt SPC(1), Bde RTO (1) = 5 total	Eng PLT: SL(9), Sappers(18) = 27 total Recce Plt Tm Ldr (9), A Tm Ldr (9) = 18 total	50

Table 51
Alternative 1: Battalion Through Platoon Personnel in Leader-Digital Planner Tracks

Track Name	**Positions**		**#**
Bn HQ Personnel	Bn Cdr(1), XO(1), S2(1), S3(1), S4(1), S6(1), CSM(1), FS FSO(1), Bn RTO(2)= 10 total	The 15 individuals at Battalion level were split evenly across the three companies. Therefore, five Bn personnel were added to the total for each company.	
	Recon Plt Ldr(1), PSG(1) = 2 total Mortar Plt Ldr(1), PSG(1), Sect Ldr(1) = 3 total		
Each company – 3 iterations of the track		Co (X): Cdr(1), XO(1), 1SG(1), RTO (2), Fwd Sig Spt NCO(1), = 6 total	18 + 5 = 23 (Includes Bn #s)
		Plt for Co X: Ldr(3), PSG(3), RTO(3), FO(3) = 12 total	

Table 52
Alternative 1. Battalion Through Platoon Personnel in Squad/Section Tracks

Track Name	Positions		#
A Co Plts: Total of 3 iterations of track	Rifle SL(1), Tm Ldr (2), RM (2), Grenadier(2), AR (2) = 9x3 = 27 total	Wpns Sqd: Ldr(1), MG (2), Ammo Handler (2), A MG (2) = 7 total	34
Fire Effects Track with A Co	Bn FS: SPC(1), RTO(1) = 2 Bn Mortar: Plt Dr/RTO (2), FDC (2), SL (4), Gunner (4) Asst Gunner (4) = 16 total	Co FIST: FIST Chief (3), FS Sgt (3), FS SPC (3) = 9 total Co Mortar: Mortar Sect Ldr (3), Sq Ldr (3), Gunner (6), Carrier Dr (6), Asst Gunner (6) Ammo Bearer (6) = 30 total	57
B Co Plts: Total of 3 iterations of track	Rifle SL(1), Tm Ldr (2), RM (2), Grenadier(2), AR (2) = 9x3 = 27 total	Wpns Sqd: Ldr(1), MG (2), Ammo Handler (2), A MG (2) = 7 total	34
Snipers & Recon Track with B Co	Bn Sniper: Sqd Ldr(1), Sr Sniper(1), Sqd Sniper(4) = 6 total Bn Recon: Tm Ldr(3), A Tm Ldr (3), Scout (3), IAV Dr (4) = 13 total	Co Sniper – Sr Sniper (3), Snipers (6) = 9 total	28
C Co Plts: Total of 3 iterations of track	Rifle SL(1), Tm Ldr (2), RM (2), Grenadier(2), AR (2) = 9x3 = 27 total	Wpns Sqd: Ldr(1), MG (2), Ammo Handler (2), A MG (2) = 7 total	34
Bn Medics & BN HQ with C Co	Bn Medics = 12 total Bn Veh Dr(1), S2 Sect & S3 Sect (7), Commo (4) = 12 total	CO: Supply Sgt (3), NBC NCO (3), Armorer (3) = 9 total	33

Alternative 2 NET Tracks

Table 53
Alternative 2. Brigade Personnel in Leader-Digital Planner Track and Squad/Section Track

Track Name	Positions		#
Bde Track Leader – Digital Planner	Bn Cdr (1), S2(1), S3 (1), CSM (1) = 4 total RSTA Squadron: Cdr (1), S3 (1), S2(1), XO (1), CSM(1), RTO(2) = 7 total	Eng Co Cdr(1), XO(1), 1SG(1) = 3 total Eng Plt Ldr (3), PSG(3) = 6 total Recon Trp: Cdr(3) XO (3), 1SGT (3) = 9 total Recce Plt Ldr (9), PSG (9)= 18 total	47
Bde Track – Squad/Section		Eng PLT: SL (9), Sappers (18) = 27 total Recce Plt Tm Ldr (9), A Tm Ldr (9) = 18 total	45

Table 54
Alternative 2: Battalion Through Platoon Personnel in Leader-Digital Planner Tracks

Track Name	**Positions**		**#**
Bn HQ Personnel	Bn Cdr(1), XO(1), S2(1), S3(1), S4(1), S6(1), CSM(1), FS FSO(1), Bn RTO(2)= 10 total Recon Plt Ldr(1), PSG(1) = 2 total Mortar Plt Ldr(1), PSG(1), Sect Ldr(1) = 3 total	The 15 individuals at Battalion level were split evenly across the three companies. Therefore five Bn personnel were added to the total for each company.	
Each company – 3 iterations of the track		Co (X): Cdr(1), XO(1), 1SG(1), RTO (2), Fwd Sig Spt NCO(1) = 6 total Plt for Co X: LDR(3), PSG(3), RTO(3), FO(3) = 12 total	18 + 5 = 23 Includes Bn #s

Table 55
Alternative 2: Battalion Through Platoon Personnel in Squad/Section Tracks

Track Name	**Positions**		**#**
A Co (all 3 plts) Plus Bn Mortars & Bn Veh Dr.	Rifle SL (3), Tm Ldr (6) = 9 x 3 = 27 total	Wpns Sqd Ldr(1) = 3 x 1 = 3 & A MG (2) = 3x 2; 9 total Sr Sniper (1), Mort Sect Ldr (1); Mort SL (1) = 3 total Bn Veh Dr (1), Mortar Plt Hq FDC (2) Mortar SL (4) = 7 total	46
B Co (all 3 plts) plus Recon & snipers	Rifle SL (3), Tm Ldr (6) = 9 x 3 = 27 total	Wpns Sqd Ldr(1) = 3 x 1 = 3 & A MG (2) = 3x 2; 9 total Sr Sniper (1), Mort Sect Ldr (1); Mort SL (1) = 3 total Bn Recon Plt HQ Tm Ldr (3); Sniper SL (1), Sniper (4) = 8 total	47
C Co (all 3 plts) plus medics	Rifle SL (3), Tm Ldr (6) = 9 x 3 = 27 total	Wpns Sqd Ldr(1) = 3 x 1 = 3 & A MG (2) = 3x 2; 9 total Sr Sniper (1), Mort Sect Ldr (1); Mort SL (1) = 3 total Bn Medics (12) = 12 total	51

Sequencing of Squad/Section and Leader-Digital Planner Tracks

A major resource decision was to assume there would be one (1) trainer per six (6) individuals. This ratio was used in all tracks and in all blocks of training. This decision was based on the hands-on nature of training required for LW skills as well as the fact that the Soldiers indicated in the NET survey and focus groups that small-group training was beneficial.

Also, as indicated in the POIs (refer to Tables 46 and 47), the intent was to have the leader-digital planner and squad/section tracks within a company finish individual training at the same time so consolidated collective training could begin without a delay.

The next figures show the break-out of the leader-digital planner and squad/section tracks for Alternatives 1 and 2. The first figure illustrates the brigade, the next two show the Battalion-Company breakouts for Alternative 1, and the last two show the Battalion-Company breakouts for Alternative 2. These figures also show the number of individuals to be trained, the number of trainers, and the length of the individual and collective training phases within the recommended POIs.

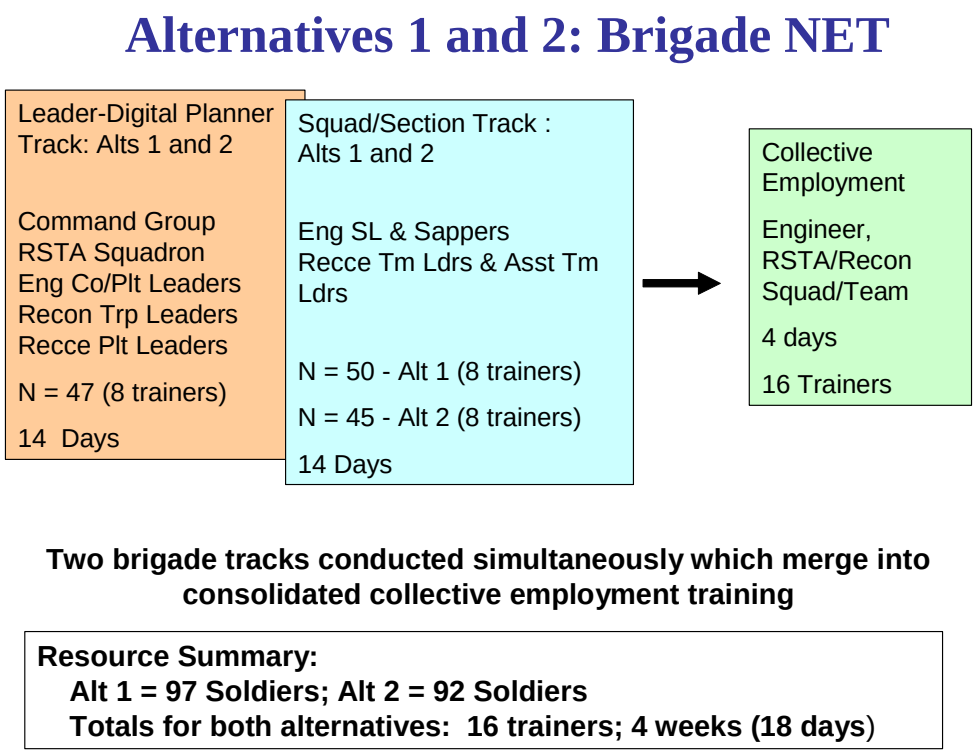


Figure 24. Brigade NET track training for Alternatives 1 and 2.

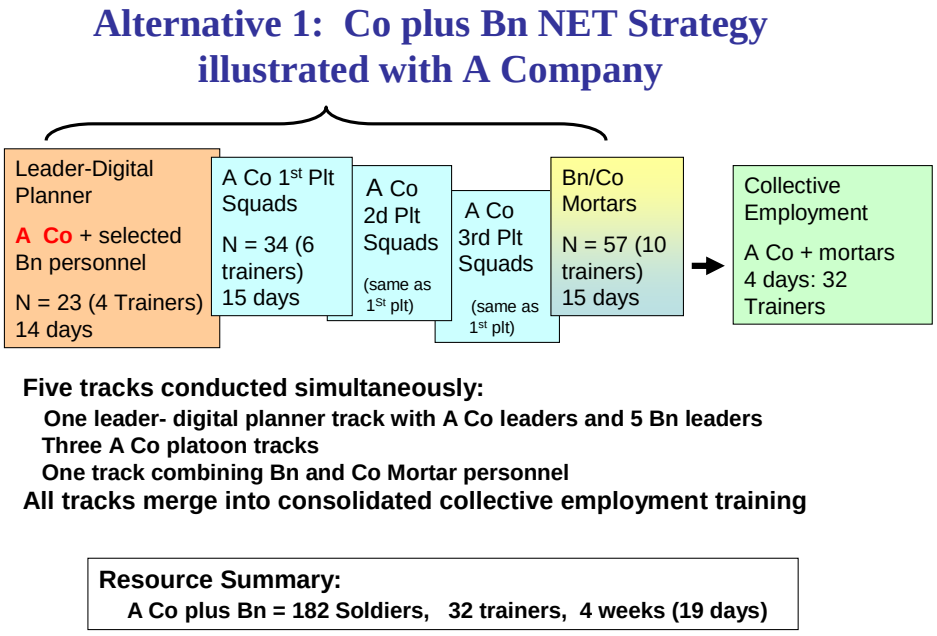


Figure 25. A Company (with Battalion and Platoon) track training for Alternative 1.

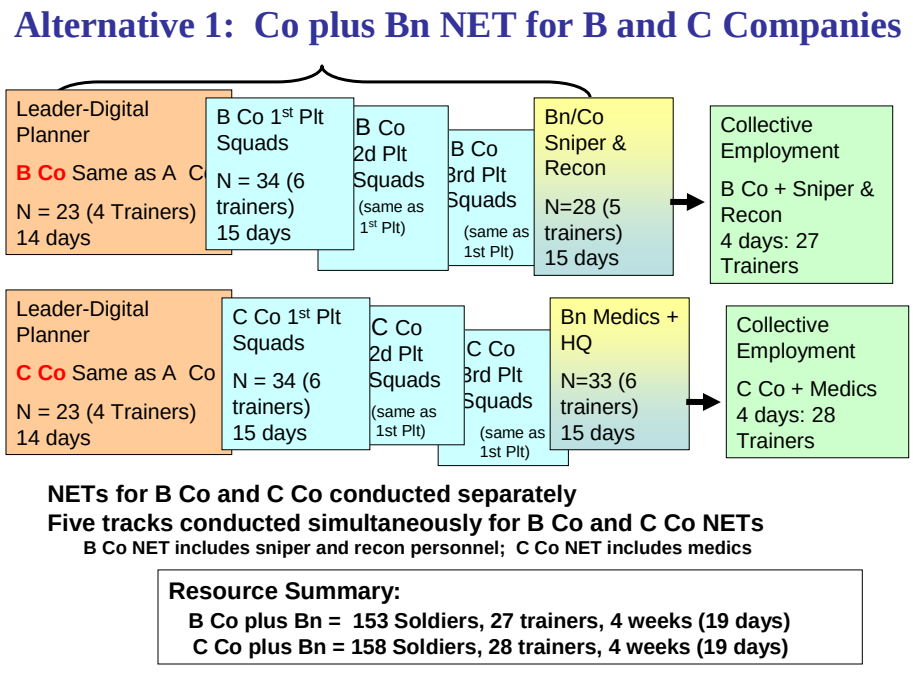


Figure 26. B and C Company (with Battalion and Platoon) track training for Alternative 1.

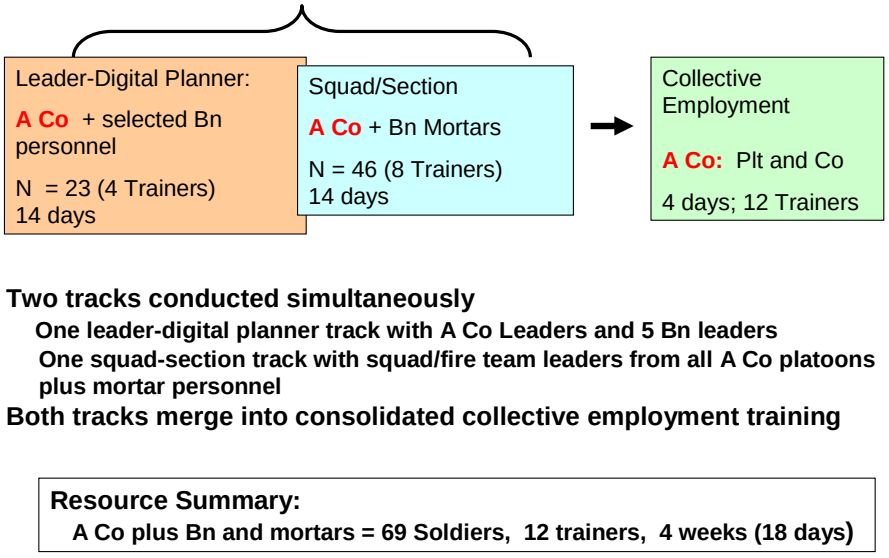


Figure 27. A Company (with Battalion and Platoon) Track Training for Alternative 2.

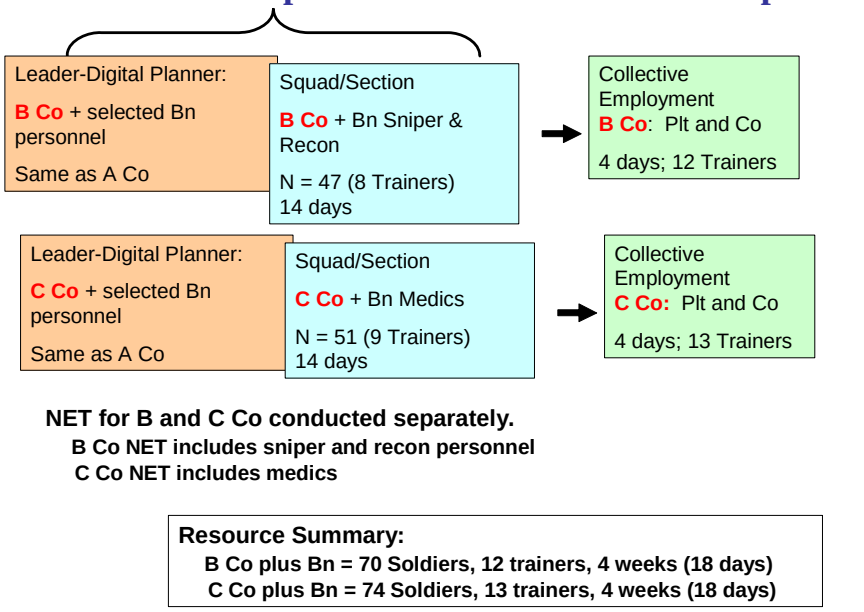


Figure 28. B and C Company (with Battalion and Platoon) track training for Alternative 2.

Sequence and Resources for a Brigade NET

Nonconsumable resources. Before the final resources could be determined for NET for a Stryker Brigade, it was necessary to develop a strategy for sequencing the NET for the different tracks across the three (3) battalions within the Brigade. Given the large numbers of Soldiers to be trained, it was resource prohibitive to train everyone simultaneously. The NET had to be conducted in phases or cycles. Given that the tracks, shown in Figures 24 through 28, were 18 to 19 days in length, a month (4 weeks) was determined to be the length of each NET cycle. It was also determined that sufficient resources existed to train more than one company-level NET during this one month period.

For Alternative 1, five (5) cycles were identified to train the Brigade personnel and all individuals within each of the three (3) battalions. The total number of Soldiers to be trained in Alternative 1 is 1,576. The five (5) cycles resulted in a total of five (5) months for the NET. For Alternative 2, three (3) cycles were identified for training all personnel, resulting in a total of three (3) months for the NET. The total number of Soldiers to be trained in Alternative 2 is 731. The overall strategy is presented in Table 56. Details on the Brigade NET strategies and resources for each alternative, by week, are shown in Tables 57 and 58 for Alternatives 1 and 2 respectively.

Table 56
Alternatives 1 and 2: Numbers of Soldiers Trained and Trainers required for a Brigade NET

Alternative 1: 1576 Soldiers trained / 60 instructors (max)/ 20 week Brigade NET				
Month 1	Month 2	Month 3	Month 4	Month 5
Brigade 97 Soldiers 16 trainers	B Co 1st Bn 153 Soldiers 27 trainers	A Co 2nd Bn 182 Soldiers 32 trainers	C Co 2nd Bn 158 Soldiers 28 trainers	B Co 3rd Bn 153 Soldiers 27 trainers
A Co 1st Bn 182 Soldiers 32 trainers	C Co 1st Bn 158 Soldiers 28 trainers	B Co 2nd Bn 153 Soldiers 27 trainers	A Co 3rd Bn 182 Soldiers 32 trainers	C Co 3rd Bn 158 Soldiers 28 trainers
Alternative 2: 731 Soldiers trained / 53 instructors (max) / 12 week Brigade NET				
Brigade 92 Soldiers 16 trainers	2nd Bn: A, B, C Co 213 Soldiers 37 trainers	3rd Bn: A, B, C Co 213 Soldiers 37 trainers		
1st Bn: A, B, C Co 213 Soldiers 37 trainers				

Nonconsummable resources are also shown in Tables 57 and 58. It was assumed that one projection system and two LW systems are needed in each classroom. In each classroom, two LW systems are needed for the instructors to demonstrate the network and communication features of the system. The same LW systems are also required for the trainers during training exercises in the field. For classroom training, each trainer needs a monitor to observe Soldier

performance during the training. Lastly, a handheld display (HHD) that enables each trainer to observe Soldier performance in the field is required.

Table 57
Alternative 1 NET Sequence and Resources

Week	Units Trained	# Soldiers	Nonconsummable (Reusable) Resources			
			# Trainers per unit	# LW systems for trainers	# HHD	# Classrooms / # projection systems / # monitors
1	Brigade 1st Bn A Co + mortars	97 182	16 32	14	48	7 / 7 / 48
2	Same as Week 1	Same as Week 1				2 / 2 / 12
3	Same as Week 1	Same as Week 1				0 / 0/ 0
4	Same as Week 1	Same as Week 1				7 / 0 / 0
5	1st Bn B Co + sniper/recon 1st Bn C Co + medics	153 158	27 28	20	55	10 / 10 / 55
6	Same as Week 5	Same as Week 5				2 / 2 / 8
7	Same as Week 5	Same as Week 5				0 / 0 / 0
8	Same as Week 5	Same as Week 5				10 / 0 / 0
9	2nd Bn A Co + mortars 2nd Bn B Co + sniper/recon	182 153	32 27	20	59	10 / 10 / 59
10	Same as Week 9	Same as Week 9				2 / 2 / 8
11	Same as Week 9	Same as Week 9				0 / 0 / 0
12	Same as Week 9	Same as Week 9				10 / 0 / 0
13	2nd Bn C Co + medics 3rd Bn A Co + mortars	158 182	28 32	20	60	10 / 10 / 60
14	Same as Week 13	Same as Week 13				2 / 2 / 8
15	Same as Week 13	Same as Week 13				0 / 0 / 0
16	Same as Week 13	Same as Week 13				10 / 10 / 0
17	3rd Bn B Co + sniper/recon 3rd Bn C Co + medics	153 158	27 28	20	55	10 /10 / 55
18	Same as Week 17	Same as Week 17				2 / 2 / 8
19	Same as Week 17	Same as Week 17				0 / 0 / 0
20	Same as Week 17	Same as Week 17				10 / 0 / 0

Note. 1 HHD per trainer. 1 monitor per trainer for training in classroom. 2 LW systems per classroom. 1 projection system per classroom.

Table 58
Alternative 2 NET Sequence and Resources

Week	Units Trained	# Soldiers	Nonconsummable (Reusable) Resources			
			# Trainers per unit	# LW systems for trainers	# HHD	# Classrooms / # projection systems / # monitors
1	Brigade	92	16			
	1st Bn A Co + mortar	69	12	16	53	8 / 8 / 53
	1st Bn B Co + sniper/recon	70	12			
	1st Bn C Co + medics	74	13			
2	Same as Week 1	Same as Week 1				4 / 4 / 20
3	Same as Week 1	Same as Week 1				0 / 0/ 0
4	Same as Week 1	Same as Week 1				8 / 0 / 0
5	2nd Bn A Co + mortar	69	12			
	2nd Bn B Co + sniper/recon	70	12	12	37	6 / 6 / 37
	2nd Bn C Co + medics	74	13			
6	Same as Week 5	Same as Week 5				3 / 3 / 0
7	Same as Week 5	Same as Week 5				0 / 0 / 0
8	Same as Week 5	Same as Week 5				6 / 0 / 0
9	3rd Bn A Co + mortar	69	12	12	37	
	3rd Bn B Co + sniper/recon	70	12			6 / 6 / 37
	3rd Bn C Co + medics	74	13			
10	Same as Week 9	Same as Week 9				3 / 3 / 0
11	Same as Week 9	Same as Week 9				0 / 0 / 0
12	Same as Week 9	Same as Week 9				6 / 0 / 0

Note. 1 HHD per trainer. 1 monitor per trainer for training in classroom. 2 LW systems per classroom. 1 projection system per classroom.

Consumable resources. The only consumable resource identified was ammunition for marksmanship training and testing with the DVS and TWS. For each Soldier in the squad/ section track, 50 rounds were allocated for zero of the DVS (both F0V), 200 rounds for training both defensive and hasty reduced exposure positions and 40 rounds for testing. For each leader in the leader-digital planner track, only the defensive position was trained (50 rounds for zeroing, 70 rounds for training, and 20 rounds for testing). For those leaders assigned the TWS, 115 rounds were allocated for training and testing in reduced exposure defensive positions. Rounds for each automatic rifleman were included for training on the defensive reduced exposure positions only: 320 rounds for the DVS and 320 rounds for the TWS.

In all cases, additional rounds were included for retesting, based on the assumption that 25% of the Soldiers would be retested. The ammunition summary is at Table 59.

Table 59
Ammunition Requirements

Ammunition	**Alternative 1**	**Alternative 2**
M4 Carbine, 5.56 ball	345,580 rounds	200,990 rounds
Squad Automatic Weapon, 5.56 linked	84,452 rounds	0 rounds

Note. In Alternative 2, the automatic rifleman does not have a LW system.

Recommended NET POI: Conclusions

The recommended NET POIs differ substantially from the Stryker NET that was executed in 2006. They address weaknesses identified from the systematic training observations of the Stryker NET, Soldier surveys, leader focus groups, prior LW experiments, research on learning and the diffusion of innovations, and the LW LUT. The recommended POIs should provide the needed training for individuals and units to operate the system; to integrate LW skills into their repertoire of individual and collective skills; to employ the system successfully at squad, platoon and company echelons: to maintain the system; and to conduct sustainment training.

The POI recommendations in this section, under MOE 2.3.4, detail what tasks should be trained and how these tasks compare to what was trained in the Stryker NET. In addition, information is included on the type of individual and collective exercises envisioned as necessary to achieve the desired level of proficiency at the end of NET. Exit criteria for individual and collective skills are specified.

The NET POI content and two-track strategy with a leader-digital planner track and a squad/section track do not differ for the two study alternatives. The POI content and the training strategy for both alternatives are the same, centering on the Infantry Company with attached battalion personnel. Tasks to be trained and tested, both individual and collective, are the same. However, the required resources for NET differ. The NET training resources for a Stryker Brigade for Alternative 1 are greater than those for Alternative 2 because twice as many Soldiers are equipped with the LW system in Alternative 1 than in Alternative 2.

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Annex A

Outline of Training Materials Provided to Soldiers

Operator's Guide

- Warnings: Aircraft; IBA; Headset; Hearing protection; HMD; Antenna, LI-145 Batteries; STORM; Laser Borelight System; Remote Cable Assembly; TWS; Vehicle Integration Kit
- Inspect LW ensemble
- Operate LW under usual conditions
- Software version/date
- Map screen functions
- Messages
- Missions
- Operate the weapon subsystem
- Configure the LW ensemble
- System test
- Purge system
- Zero Navigation subsystem
- Load an MDP
- Image editor
- Appendix:
    - Troubleshooting procedures
    - Field functionality test
    - Support equipment operations
    - Land Warrior maintenance procedures
    - Glossary
    - Figures – in black and white

Quick reference card

- LW Ensemble
    - Start up/power on procedures
    - Field functionality test
    - Troubleshooting
- Vehicle integration kit
    - Startup/power on procedures
    - Shut down/power off procedures
    - Troubleshooting
- Vehicle based charger
    - Start up/power on procedures
    - User interface/status lights
    - Troubleshooting

Annex B

Performance Test

Lesson Plan OPR 1011: Performance Evaluation
Task/Subtask Evaluation Checklist (Grade Sheet)

Rank: _____ Name: _____ Date: _____

Weapon Type: _____

Test Administrator Name: _____Test Station #:_____

Task	Performance Steps	GO	NG	Comments
1. Assemble the LW System	a. Configure the Weapon Subsystem (WSS)			**Attach Devices Only**
	• Install Weapons User Input Device(WUID)*****			
	• Install Daylight Video Sight (DVS) in the correct rail position			Instructor's Note: Rail # L26* (M4)
	• Install Thermal Weapon Sight (TWS)			If Issued
	• Attach M249 Cable bracket			NA for M4 & M203
	• Attach M203 DVS Bracket			NA for M4 & M249
	• Route cable			
	b. Configure the Helmet Subsystem (HSS)			
	• Install Helmet Mounted Display (HMD)*****			
	c. Configure the Body Subsystem (BSS)			
	• Install batteries*			
	d. Don the LW System			Connect all required cables
2. Operate the LW System	• Power-on the LW System			
	• Log on to the LW System*			
	• Enable audio and visual alerts			
	• Configure Correct Talk Group			
	• Configure Call for Medic Recipient			To the Instructor ensemble role
	• Change map			
	• Acquire Satellites			
	• Locate Graphic Bearing Indicator			
	• Turn off Gridlines			
	• Zoom in			
	• Zoom out			
	• Place coordination point symbol on map at given coordinates (1)			
	• Place coordination point on map at given coordinates (2)			
	• Measure distance between coordination points			
	e. Displace coordination point to: 10T ET 29000 19000			

	• Filter friendly SA			
	• Display friendly SA			
	• Mute Talk Button 2			
	• Unmute Talk Button 2			
3. Perform Voice Communication	a. Press the correct Push to Talk button on the SCU and send a voice message to the desired talk group*			
	b. Press the correct Push to Talk button on the SCU and reply back to a voice message on the desired talk group*			
	c. Press the Push to Talk button on the WUID and send a voice message to the desired talk group*			
	d. Press the Push to Talk button on the WUID and reply back to a voice message on the desired talk group*			
4. Send Digital Messages using the LW system	a. In messages menu select Free Text message			
	• Create Free Text message			
	• Select priority and recipient			Send Flash priority
	• Send message*			
	• Receive a Free Text Message			
	b. Delete a Free Text message			
5. Call/Cancel Call For Medic (CFM)	a. (ACTIVATE) Send CFM. Press the PTT button on Soldier Control Unit (SCU) for 5 seconds*			Configured to be received by the Instructor.
	b. (CANCEL) CFM Press the PTC button on SCU for 10 seconds*			Configured to be received by the Instructor.
	• Receive CFM			Sent by Instructor
	• Open and click View on Map			
	• View Icon change on map			
	• Receive Cancel CFM			Sent by Instructor
	• Open and click View on Map			
	• View Icon change on map			
6. Operate the Weapon Subsystem	a. Display DVS Image*			
	• Change Magnification			
	• Display map on HMD			
	• Change Reticle Type			NFOV to Reverse
	b. Display TWS image*			NA if Not Issued
	• Change TWS Magnification			NA if Not Issued
	• Display map on HMD			
7. Navigate	• Calibrate compass*			
8. Purge/Zeroize the Land Warrior System	a. Press the Purge button on the SCU			**SIMULATED**
	b. Press the Zeroize button on the NSS **(DELETED FROM TEST – C CO)**			**SIMULATED**
	c. Press the Zeroize buttons on the CNRS **(DELETED FROM TEST – C CO)**			**SIMULATED**
9. Perform Shutdown Procedures	a. Select Logoff from menu*			
	• Doff the Land Warrior System			

Annex C

Report Acronyms

AAR	After action review
ACH	Advanced combat helmet
AI	Assistant instructor
AMSAA	Army Materiel Systems Analysis Activity
ANOVA	Analysis of Variance
AoA	Analysis of Alternatives
ARI	Army Research Institute
ATEC	Army Test and Evaluation Command
BIT	Built-in test
BN	Battalion
BOI	Basis of issue
BSS	Body subsystem
CALFEX	Combined arms live-fire exercise
CDA	Commander's digital assistant
CFF	Call for fire
CFM	Call for medic
CLS	Contractor logistics support
CNRS	Communications network radio subsystem
Co	Company
CSS	Combat service support
DA	Department of the Army
DOTMLPF	Doctrine, organization, training, materiel, leadership and education, personnel and facilities
DRD	Dead reckoning device
DREF	Defensive reduced exposure fire
DTT	Doctrine and tactics training
DVS	Daylight video sight
EEA	Essential element of analysis
ELO	Enabling learning objective
ENY	Enemy
EPLRS	Enhanced position location reporting system
FBCB2	Force XXI Battle Command Brigade and Below
FFT	Field functionality test
FO	Forward observer/ firing order

FOOM	Formations and orders of movement
FOV	Field of view
FIPRO	Flash, immediate, priority, routine, and out
FRAGO	Fragmentary order
FS	Fire support
GBI	Graphic bearing indicator
GFE	Government furnished equipment
GPS	Global positioning system
HREF	Hasty reduced exposure fire
HIA	Helmet interface assembly
HHC	Headquarters and Headquarters Company
HHD	Handheld display
HMD	Helmet mounted display
HQ	Headquarters
HRED	Human Research and Engineering Directorate
HSS	Helmet subsystem
IR	Infrared
IVF	Indirect view fire
JCF AWE	Joint Contingency Force Advanced Warfighting Experiment
JVMF	Joint Variable Message Format
KD	Known distance
L	Leader
LAN	Local area network
LBE	Load bearing equipment
LFX	Live fire exercise
LUT	Limited User Test
LW	Land Warrior
MANOVA	Multivariate analysis of variance
MDP	Mission data package
MDSE	Mission data support equipment
MFL	Multifunction Laser
MOE	Measure of effectiveness
MOI	Memorandum of instruction
MOP	Measure of performance
MOUT	Military operations in urban terrain
MW	Mounted Warrior
NCO	Noncommissioned officer

NCOIC	Noncommissioned officer in charge
NET	New Equipment Training
NETT	New Equipment Training Team
NFOV	Narrow field of view
NL	Nonleader
NOD	Night observation device
OBS	Obstacle
OPORD	Operation order
OPS	Operations
PE	Practical exercise
PI	Principal instructor
POI	Program of instruction
PMCS	Preventive maintenance checks and services
PM-SWAR	Program Manager –Soldier Warrior
PSG	Platoon sergeant
PTT	Push-to-talk
QRC	Quick reference card
REF	Reduced exposure fire
RFI	Rapid fielding initiative
RTO	Radio-telephone operator
SA	Situation awareness
SAM	Soldier access module
SAW	Squad automatic weapon
SBCT	Stryker Brigade Combat Team
SCU	Soldier control unit
SER	System Evaluation Report
SINCGARS	Single channel ground and airborne radio system
SL	Squad leader
SME	Subject matter expert
SOP	Standing operating procedure
STRAP	System training plan
STORM-MLRF	Small tactical optical rifle-mounted micro-laser rangefinder (STORM)
STX	Situational training exercises
TCM-S	TRADOC Capabilities Manager-Soldier
TLO	Terminal learning objective
TRAC-MTRY	TRADOC Analysis Center- Monterey
TRAC-WSMR	TRADOC Analysis Center-White Sands Missile Range
TRADOC	Training and Doctrine Command
TTP	Tactics, techniques, and procedures
TWS	Thermal weapon Sight

URN	Unit reference number
USAIS	US Army Infantry School
USB	Universal serial bus
UTO	Unit task organization
VIK	Vehicle integration kit
WARNO	Warning order
WFOV	Wide field of view
WSS	Weapon subsystem
WUID	Weapon user input device

APPENDIX B

GROUND SOLDIER SYSTEM TRAINING IMPACT ANALYSIS: INSTITUTIONAL TRAINING AND NEW EQUIPMENT TRAINING

Ground Soldier System Training Impact Analysis: Institutional Training and New Equipment Training

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November 2007

Ground Soldier System Training Impact Analysis: Institutional Training and New Equipment Training

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Ground Soldier System Training Impact Analysis: Institutional Training and New Equipment Training

Background

The Ground Soldier System (GSS) Training Impact Analysis is one component of the GSS DOTMLPF (Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel and Facilities) assessment, which in turn is part of the GSS Analysis of Alternatives (AoA), directed by TRADOC (TRADOC, 2007). In addition to the DOTMLPF analysis, the AoA includes force effectiveness analyses, an assessment of the impact of network performance on force effectiveness, and cost analyses. The integrated results will be used to determine the impact of equipping units with the GSS, and will inform the GSS Milestone (MS) B decision. TRADOC Analysis Center was the designated the lead analytic agency for the assessment. In turn, TRAC-WSMR (White Sands Missile Range) requested that the Army Research Institute and the G3, US Army Infantry School (USAIS) be the lead analytic agencies for the training assessment.

The GSS AoA study alternatives were:

- Base case. Platoon, squad, and team leaders equipped with currently fielded and rapid fielding initiative (RFI) items.
- GSS Squad Leader (SL) Alternative. The GSS issued to the squad leader level.
- GSS Team Leader (TL) Alternative. The GSS issued to the fire team leader level.

The study directive for the AoA restricted the analysis to seven (7) Stryker Brigade Combat Teams (SBCTs), rather than fielding of the GSS system to all Army brigade combat teams (BCTs). As indicated in the following paragraphs, this restriction directly impacted the scope of the institutional training analyses. If the AoA had examined the training impact of fielding the GSS to all BCTs, existing institutional courses such as the Basic Noncommissioned Officer Course, Maneuver Advanced Noncommissioned Officer Course, Basic Officer Leader Course III Infantry, and Maneuver Captains Career Course would have been examined.

Functional courses were examined instead of existing institutional courses. In 2002, the Commanding General, US Army Infantry School made the decision that after half the force had been fielded with the Land Warrior (LW) system (nee GSS), that LW (GSS) training would be formally incorporated in existing institutional courses. Prior to that time functional courses would be used to train replacement Soldiers/leaders on the system. Replacement training is needed to train individuals who must fill positions in GSS-equipped units that have "lost" personnel through permanent change of station moves, individuals leaving the Army, and other reasons. These units have already received new equipment training (NET). Thus for the GSS AoA, which is based on only 7 SBCTs, the institutional phase of the training analysis meant examining the impact of the study alternatives on functional courses.

Training Assessment Objectives

Although the force effectiveness analysis was limited to platoon-level scenarios, the training and associated training resource analyses were based on numbers for the seven SBCTs and requirements. The essential elements of analysis (EEAs) identified for the training and leader education domain were as follows:

EEA 2.3: What are the training and leader education impacts of fielding alternatives GSS BOIs (basis of issue)?

EEA 2.3.1. What changes need to be made to institutional training?
The scope of this EEA covered resources for functional courses created to train replacement Soldiers going to units which have already received NET with the GSS.

EEA 2.3.2. What changes need to be made to unit training?
This EEA covered individual and collective tasks.

EEA 2.3.3. What are the recommended New Equipment Training (NET) programs of instruction (POIs) for each study alternative?
The scope of this EEA included NET resources and the skills and tasks to be trained.

Assumptions, Limitations, Constraints, and Other Considerations

The present analysis examined the training resources associated with Functional Courses executed by the US Army Infantry School. It did not examine the training resources associated with existing institutional courses.

It was assumed that the Functional Courses would be conducted at the Infantry School. The use of Mobile Training Teams (MTTs) was not examined.

The major training resources costed for the institutional analysis were the required numbers of GSS systems, training support equipment, and ammunition. For NET, the major training resources costed were instructors, ammunition, and training support equipment.

Training requirements that focused on specific skills for selected populations of Soldiers, e.g., GSS maintenance and training expertise, and network management, were identified and described. However the associated training resources were not costed due to the limited time for the analysis.

GSS system costs included an estimate of the cost of embedded training capabilities, as embedded training is a key performance parameter for the GSS.

Training input was provided by surveys from the leaders using the Land Warrior (LW) system in Operation Iraqi Freedom (OIF) and by subject matter experts (SMEs) who observed these leaders in theater. Interviews were also held with two of the SMEs. The sample size was

limited. With respect to the GSS, these survey results were used to identify insights, trends, and potential additional training requirements.

Prior Training Analyses

The analyses reported here built upon and updated two prior training analyses conducted as part of AoA studies for the LW system (Dyer, Centric & Dlubac, 2006; Dyer & Tucker, 2007). Figure 1 graphically illustrates this relationship.

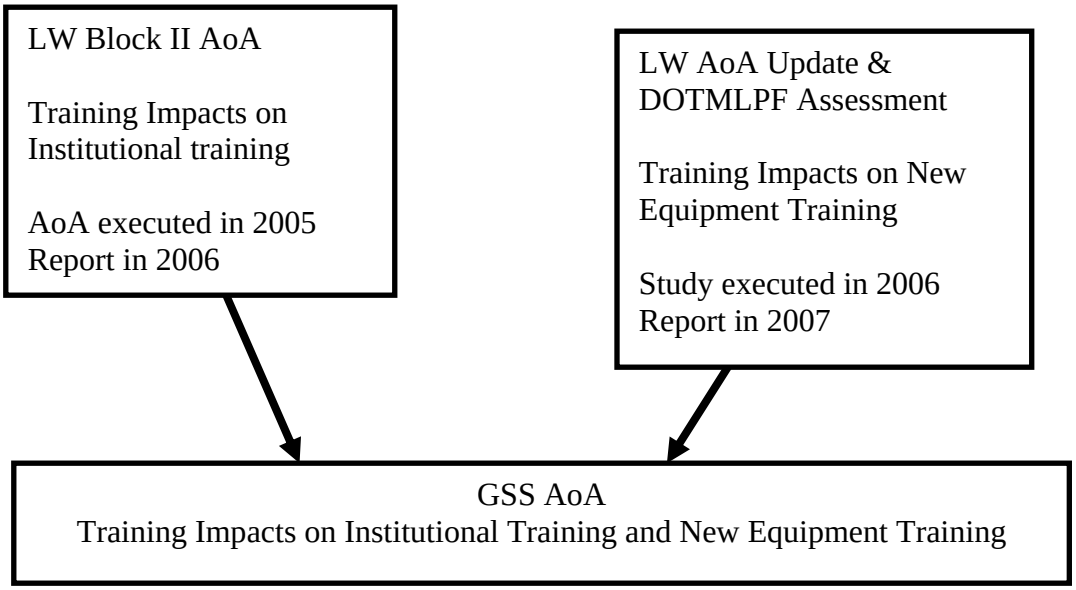

Figure 1. LW training analyses from prior LW AoAs that support the GSS AoA.

The 2006 report on LW Block II examined the impact of introducing the LW system into the US Army Infantry School courses, as well as the resources required for functional courses that supported 6 and 15 SBCTs. The four alternatives in this AoA were:

Alt 1: A non-LW alternative where every Soldier had a radio,
Alt 2: LW system issued to squad leader (SL) level,
Alt 3: LW system issued to fire team leader (TL) level, and
Alt 4: LW system issued to every individual Soldier.

The second analysis, part of a LW DOTMLPF (doctrine, organization, training, materiel, leadership and education, personnel and facilities) update, examined the sufficiency of the NET conducted during the equipping of a Stryker Battalion with the LW system in FY06. This analysis also recommended NET POIs for the two study alternatives included in the overall AoA/DOTMLPF assessment. The two study alternatives were:

Alt 1: LW issued to every Soldier, and
Alt 2: LW issued to fire team leader level.

The relationships between the GSS AoA Alternatives and EEA, and these two prior LW training analyses are summarized in Table 1. The first column cites the alternatives in the current GSS AoA. For each GSS alternative, the prior training analyses that relate to this alternative are cited, as well as what modifications had to be made to these analyses to address the GSS SL and TL alternatives in the GSS AoA. As indicated in the table, the greatest changes from prior work involved adjustments to account for 7 SBCTs and the differences between the LW and GSS systems.

Table 1. *Relationship between GSS AoA Alternatives and EEA, and Prior LW Training Analyses*

GSS AoA	**Prior Training Analyses**
GSS SL Alt	
Institutional EEA	• LW Block II for functional courses Updated LW Alt 2 (LW to SL) outcomes to account for GSS system tasks and 7 SBCT
NET EEA	• LW Update (NET analysis) Revised LW Alt 2 (LW to TL) outcomes to account for GSS issued to squad leader level only, specifically, the expanded BOI for GSS (vice LW) and more GSS tasks (vice LW).
GSS TL Alt	
Institutional EEA	• LW Block II for functional courses Updated LW Alt 3 (LW to TL) outcomes to account for GSS system tasks and 7 SBCT
NET EEA	• LW Update (NET analysis) Revised Alt 2 (LW to TL) outcomes to account for the expanded BOI for GSS (vice LW) and more GSS tasks (vice LW)

GSS Tasks and Functions to Train

A front-end analysis was conducted to identify the GSS tasks functions that must be trained. The analysis was based on current LW tasks and additional tasks specified in the GSS Capability Development Document (CDD, TRADOC 2006). Table 2 presents the tasks and functions examined during the front-end analysis for the GSS AoA. The table is divided into three sections: the tasks common to LW and GSS, four (4) additional GSS tasks per the GSS CDD that were covered in the scope of the GSS AoA training analysis, and four (4) tasks implied by the GSS CDD which were not in the scope of the AoA. The second column indicates which LW tasks were examined in the prior LW AoA update (the NET analysis). The third column indicates tasks for the GSS system, as well as comments about the expected nature of the tasks.

Table 2. *Task List for the LW and GSS Systems*

Task/ Function	**LW AoA update – NET analysis**	**GSS Capability List Used in the AoA**
Tasks/Functions Common to LW and GSS		
Assemble system	Yes	Yes
Don and doff system	Yes	Yes
Zeroize system	Yes	Yes
Configure the system – menu Configure – navigation subsystem	Yes	Yes
Use system control unit controls	Yes	Yes - assume some type of input/control device required
Use weapon user interface device controls	Yes	
Establish situation awareness (SA) settings (friendly)	Yes	Yes display friendly icons w/ property information
Display different SA settings	Yes	Yes display friendly/ enemy / unit & noncombatants - with property information (size, composition, #s)
Generate and send digital messages	Yes	Yes (assume same messages as LW)
Call for Medic (911) Call for Fire SALUTE Free text	Yes Yes Yes Yes	Yes Yes Yes Yes
Use system e-mail features (e.g., determine recipients, message priority, …)	Yes	Yes
Send and receive voice messages	Yes	Yes
Establish and change talk groups	Yes	Yes:

Task/ Function	LW AoA update – NET analysis	GSS Capability List Used in the AoA
Use basic map functions (e.g., call up maps, zoom, pan, measure distances)	Yes	Yes (includes any unique functions associated with manipulating 3-D terrain and related functions such as line of sight tools)
Plot common symbols to generate basic graphics and icons (e.g., route, waypoints)	Yes	Yes
Navigate from point to point during the day and night	Yes	Yes
Calibrate the STORM	Yes -Ldr	Yes
Employ the STORM	Yes -Ldr	Yes
Capture edit and send DVS/TWS images	Yes	Yes (assume electronic link between day and night optics to allow image capture and target engagement
Boresight DVS (a day optic)	Yes	Yes
Zero DVS	Yes	Yes
Engage targets with DVS – reduced exposure	Yes	Yes
Boresight TWS (a night optic)	Yes –selected Ind	Yes – selected individuals- assume same task scope as LW
Zero TWS	Yes – selected ind	Yes – selected individuals – assume same task scope as LW
Engage targets with TWS – reduced exposure	Yes – selected ind	Yes – selected individuals– assume same task scope as LW
Perform pre-operation checks on the system	Yes	Yes
Perform operator maintenance on the system	Yes	Yes
Troubleshoot the system	Yes	Yes
Create and modify overlays	Yes	Yes
Create and modify orders	Yes	Yes
Use MDSE for mission planning to create orders and overlays; create SAM cards , create MDP	Yes – selected individuals	Yes - assume similar equipment as LW for mission planning – selected individuals
Operate the vehicle interface	Yes (VIK w/ Stryker) – selected inds	Yes – selected individuals
Perform operator maintenance on the vehicle interface	Yes (VIK w/ Stryker) – selected inds	Yes – selected individuals
Load MDP on system	Yes	Yes
Other training elements		

Task/ Function	LW AoA update – NET analysis	GSS Capability List Used in the AoA
Block of instruction on network architecture	Yes	Yes
Apply and integrate system skills in a field environment	Yes	Yes
GSS Specific Tasks Covered in GSS AoA Training Analysis		
Process/transmit/interpret sensor input from such sensors as: UAV, UGS (robotics), and unattended ground sensors. Assume static and/or streaming video forms, and audio alerts	No	Yes
Setup/configure/ operate the remote physiological status monitor	No	Yes
Receive messages/alerts from physiological status monitors.	No	Yes
Access embedded training (ET) exercises (system training mode)	No	Yes
Tasks implied by GSS CDD but not part of GSS AoA Training Analysis		
Engage targets with BLOS (beyond line of sight) capability	No	No- requires that grenadiers have the system and the appropriate sights. Grenadier will not have a GSS per the AoA alternatives
Operate language translation subsystem	No	No – Outside of AoA scope
Operate enhanced sensing component(s)	No	No - Outside of AoA scope
Operate the facial recognition technology interface/subsystem	No	No – Outside of AoA scope

Note. Acronyms: STORM - small tactical optical rifle-mounted micro-laser rangefinder); DVS – daylight video sight; TWS – thermal weapon sight; BLOS – Beyond line of sight; VIK – vehicle integration kit; MDSE – mission data support equipment; SAM – Soldier access module; MDP - mission data package; UAV – unmanned aerial vehicle; UGS –unmanned ground system; ldr – leader; ind – individuals.

It is important to note that embedded training features were not expected to increase training time, but rather to facilitate system learning and system expertise.

Programs of Instruction

The Core Program of Instruction

Historically, the training strategy for the LW system has distinguished between requirements for training leaders and non-leaders (e.g., USAIS System Training Plans (STRAPs) for LW, dated 2005 and 2004). This was also the case in the prior LW AoA and the LW Update (NET analysis), although the concept was applied slightly differently in each AoA. For this GSS AoA, the training strategy model for the POI was based on that used in the LW AoA update for NET. A major recommendation from the LW Update analysis (Dyer & Tucker, 2007) was to establish two tracks for training. One track, called the Leader-Digital Planner track, was for leaders at the platoon level and above who are responsible for mission planning. This track also included personnel who support leaders in mission planning. The other track was for individuals at the squad and equivalent echelons, called the Squad track.

The core POI presented here for the GSS AOA is the same for both GSS BOI alternatives. In addition, for both the Squad and the Leader-Digital Planner tracks, this core POI, including a system performance test, covers 14 days. The primary differences between the two tracks are:

-Only the Leader-Digital Planner track receives training on mission planning;
-The Squad track receives more training than the Leader-Digital Planner track on reduced exposure observation, scanning, and target engagement techniques,
-The Leader-Digital Planner track has night land navigation only while the Squad track has both day and night land navigation,
-The Squad track has more day and night situational exercises than the Leader-Digital Planner track.

For both tracks, the additional four unique GSS tasks cited in Table 2 were incorporated in the 14-day training period.

For the functional courses (institutional training), it was also necessary to add administrative time to account for in/out processing of the students as well as issue and turn-in of the GSS systems. The administrative time estimates were based on times for the same functions in current Infantry School courses. Thus the estimated time for each track in the functional course is 16 days (3 weeks). It was also assumed that the number of students in each track will be determined on-site, as it is impossible to predict these numbers. Trainers will divide the class, as needed, into the squad and leader-digital trainer tracks.

For NET, after the 14-day individual training period, four (4) days are scheduled for unit collective training at the platoon and company levels. Consequently, NET for a given Soldier unit requires four (4) weeks. Multiple iterations are required to provide NET to a brigade. Details on this strategy are in the NET section of this report.

This core POI is outlined in Table 3 below and covers the tasks cited in Table 2. The table depicts the training for each study alternative, the two training tracks, and both institutional training (functional courses) and NET. In addition, the estimated training times are shown.

Table 3. *Recommended Core POIs for Institutional Training and NET*

Functional Courses and New Equipment Training			
Squad Track	**Content**	**Leader-Digital Planner Track**	**Content**
Day 1	• System assembly; Don and Log-on	Day 1	• System assembly, Don & Log-on • Start System Operation
Day 2 Day 3	• Operate – core topics: Load MDP; Configure system; Change system configurations; Structure of the software interface; Messages – types, sending, receiving; use of maps and map functions; basic use of symbols, drawing basic graphics (e.g., route); selecting/viewing/ interpreting overlays; introduction to weapon subsystem • Receive/ transmit sensor input; configure and operate physiological status monitor; access ET exercises. • Troubleshoot; system checks, field functionality test • Squad and/or team leaders get basic instruction on receiving/viewing/interpreting orders; modifying overlays • Specific individuals need training on STORM and TWS	Day 2 Day 3	• Operate - core topics Load MDP; Configure system; Change system configurations; Structure of the software interface; Messages – types, sending, receiving; use of maps and map functions; basic use of symbols, drawing basic graphics (e.g., route); selecting/viewing/ interpreting overlays; introduction to weapon subsystem • Receive/ transmit sensor input; configure and operate physiological status monitor; access ET exercises. • Troubleshoot, system checks, field functionality test • Specific individuals need training on STORM • Network structure, Advanced commo instruction
Day 4	• Day land navigation (Go/NoGo) • Night land navigation (Go/No Go)	Day 4	• Prerequisite skill training/ diagnostics • Advanced/follow-on operator training
Day 5	• Prerequisite skill training/diagnostics • Advanced/follow-on operator training	Day 5	• MDSE (day 1) • Night land navigation (Go/No Go)

Functional Courses and New Equipment Training			
Squad Track	**Content**	**Leader-Digital Planner Track**	**Content**
Day 6	• Boresight and Zero	Day 6	• MDSE continued
Day 7	• Scanning and Reduced exposure fire training	Day 7 Day 8	• MDSE continued; • Planning process with LW system (Orders, Overlays, MDP)
Day 8	• Reduced exposure fire testing		
Day 9	• Individual employment basics to include troubleshooting (day and night)	Day 9[b]	• Boresight/Zero and Scanning training
Day 10	• Individual employment basics (day and night) cont'd	Day 10[b]	• Reduced exposure firing and test
Day 11[a]	• Squad exercises (day and night) w/ Stryker[c]	Day 11	• Reduced exposure fire cont'd • Start individual employment basics (day & night)
Day 12[a]	• Squad exercises (day and night) w/ Stryker[c]	Day 12	• Employment basics continued (day & night)
Day 13	• Reinforcement/retraining (actual day in POI will be conducted when needed)	Day 13	• Reinforcement/retraining (actual day in POI will be conducted when needed)
Day 14	• Individual testing, to include duty specific testing	Day 14	• Individual testing, to include duty specific testing
Functional Courses Only: Additional 2 days			
One day at course start for in-processing and issue of systems to students / system accountability One day at course end for out-processing and turn in of systems / system accountability			
NET Only: Unit Collective Exercises (additional 4 days)			
Day 15 Day 16 Day 17 Day 18	• Platoon and Company exercises (to include Strykers and night exercises) Cadre-led training followed by Unit-led training • After Action Reviews (AARs) • Capstone Exercise		

Note. Prerequisite skill requirements differ for the two tracks. For example, Squad track will provide weapon/device skills, night observation devices for some, messages, simple graphics. Leader-Digital Planner track will need FBCB2, orders, graphic control measures.

[a] For NET, the entire squad is present for collective training. This includes all unit members without a GSS system. Squad and team leaders work with unit members with their equipment as assigned.

[b] Marksmanship exit criteria for Leader-Digital Planner and Squad tracks differ.

[c] Stryker vehicles may not be available for the functional courses.

OIF Feedback on LW

A short training survey was distributed by TCM-Soldier representatives to leaders using the LW system in Operation Iraqi Freedom (OIF). The intent was to obtain insights into LW training and functions that could affect the GSS training strategy. Surveys were received from 14 combat leaders. In addition, seven SMEs who represented the combat and materiel developers and who observed the LW unit in OIF for 4 to 5 months, completed the survey and two were interviewed. Demographic information on these individuals is in Table 4.

Table 4. *Demographic Profile of Individuals who Completed the OIF Training Survey*

Combat Leaders Surveyed (14 total)		
#, Duty Position, and Rank	Time in Army: months / years	LW Training: NET or while deployed
1 Asst Gunner (SPC)	22.0 / 1.8	1 NET
3 Team Leaders (SPC, CPL, SGT)	37.3 / 3.1	2 NET, 1 deployed
2 Rifle Squad Leaders (SSG)	78.0 / 6.5	2 NET
1 Weapons Squad Leader (SSG)	84.0 / 7.0	1 NET
2 Section Sergeants (SSG)	84.0 / 7.0	1 deployed, 1 unknown
2 Platoon Sergeants (SFC)	209.0 / 17.4	1 deployed; 1 unknown
3 Platoon Leaders (1LT)	34.0 / 2.8	1 NET, 2 deployed
SMEs Surveyed (7 total)		
2 military from TCM-Soldier 5 from Project Manager Office		

As indicated in Table 5, four questions were asked about 15 specific LW tasks / functions. The "Add tactical symbol" (sometimes called tactical chem lights) is a LW system capability that was added after NET. It allows individuals to mark their map (with colored-coded small ovals) to provide additional SA and /or information, and disseminate it as appropriate. For example, a cleared building could be marked with a green oval. By accident, six of the 14 leaders surveyed did not get the modified survey that included the tactical symbol capability. Survey responses, separated by leader and SME input using a "/" mark, are shown in Table 5.

Table 5. *OIF Survey Results from Leaders and SMEs*

	Questions			
Land Warrior Task or Function	1. Check the tasks / functions for which proficiency is hard to maintain. *Check all that apply.*	2. Which tasks/functions did use in over 50% of your missions? *Check all that apply.*	3. Which functions have you found most critical to mission success? *Check all that apply.*	4. When training new leaders on LW, which tasks/ functions did you stress? *If you did **not** train new leaders, please check the NA box* ***NA:*** □
	Leader (n =14) / SME (n = 7)	Leader (n =14) / SME (n = 7)	Leader (n =14) / SME (n = 7)	Leader (n = 4) / SME (n = 7)
Voice communications	43% / 0%	7% / 86%	14% / 43%	75% / 52%
Change call groups	7% / 29%	7% / 43%	7% / 0%	0% / 52%
Maintain SA of unit members	14% / 0%	100% / 100%	93% / 100%	100% / 71%
Use GPS & basic graphics to assist in navigation	14% / 0%	93% / 100%	79% / 100%	100% / 71%
Measure distances on map/imagery	0% / 0%	43% / 57%	36% / 43%	75% / 43%
Send digital messages				
911 Call for medic	0% / 0%	0% / 0%	7% / 14%	0% / 29%
Text	7% / 0%	43% / 57%	36% / 57%	50% / 86%
CFF	0% / 0%	0% / 0%	14% / 0%	0% / 43%
SALUTE	0% / 0%	21% / 29%	29% / 29%	0% / 71%
Add tactical symbol[a]	0% / 0%	88% / 86%	88% / 86%	100% / 86%
Develop or modify any type of order	7% / 57%	0% / 29%	7% / 14%	0% / 71%
Develop or modify overlays that support orders	14% / 57%	14% / 43%	21% / 57%	75% / 86%
Use pre-loaded digital images	0% / 29%	57% / 57%	50% / 57%	75% / 57%
Use DVS for target surveillance	14% / 0%, 1NA	29% / 0%,1NA	29% / 0%,1NA	75% / 14%,1NA
Use DVS to engage targets – reduced exposure fire	36% / 0%,1NA	7% / 0%,1NA	7% /-0%,1NA	0% / 14%,1NA

Note. For question 4, the SMEs were asked what tasks/functions should be stressed. Only 4 leaders indicated they had trained other individuals while deployed. Only one leader response to the tactical symbol item was available.

[a] Tactical symbol task was not added to 6 of the leader surveys. A total of 14 leaders and all SMEs answered this item.

Interviews with two SMEs, who were with the Land Warrior unit in OIF for 5 months and observed many missions, provided additional insight into the responses to several of the tasks and functions.

Regarding which tasks or functions were the hardest to maintain proficiency, the leaders and SMEs provided slightly different perspectives. Except for voice communications and engaging targets from reduced exposure posture, the leaders did not indicate difficulties with sustaining skills. However, the SMEs (57%) indicated that order and overlay skills could be subject to decay. These differences could be explained by the fact that the SMEs interviewed indicated that orders and overlays were typically developed and/or modified at the platoon level and above (the survey sample included only 3 platoon leaders) and that the SMEs observed company and battalion level actions as well (no personnel from the company and battalion headquarters in the sample).

With regard to use of the tasks and functions, both groups (at least 85%) were clearly in agreement that maintaining SA, employing the global positioning system (GPS) and basic graphics to assist in navigation, and using the tactical symbols were frequent applications of the system. In addition, about half of both groups indicated frequent use of three other functions: measuring distances, sending text messages, and using pre-loaded digital images. Lastly, the SMEs identified three other functions that were used frequently: voice communications, changing call groups, and developing/modifying overlays.

During the interviews, the SMEs/observers cited some reasons for why some functions were not used frequently. The 911 Call for Medic (CFM) feature was not used as the unit medics were typically on the scene to treat casualties as they occurred. Similarly, the call for fire message was not used because leaders found the process time-consuming (use STORM-MLRF, get grid coordinates of the target, relay messages through FM radio to the company or battalion mortars or Air Weapons Team for processing). The SMEs/observers also stated that typically only the leaders assigned the STORM-MLRF (squad leaders) carried the weapon subsystem and therefore reduced exposure observation and firing techniques were not used. Weight was reduced by not carrying the weapon subsystem. The daylight video sight was observed to be used by some (e.g., scouts) in a hand-held mode for surveillance purposes.

The functions most critical to mission success were the same three that were used most frequently: SA, GPS and basic graphics, and tactical symbols. Over half the SMEs also cited text messages, orders, and overlays.

Only four leaders indicate they had trained other Soldiers while in theater. Eight tasks/functions were marked as ones stressed by at least three of these leaders: voice communications, SA, GPS/basic graphics, measure distances, tactical symbols, overlays, pre-loaded digital images, and DVS for target surveillance. As indicated in Table 5, the SMEs indicated they would stress all but the CFM and the DVS tasks.

Leaders did not cite other LW functions or system capabilities that they used frequently or viewed as critical to mission success.

In general, the survey responses indicated that the task and functions included in the core POI (see Table 3) are relevant and appropriate. The interviews indicated that system use and criticality could be mission dependent; features important in one mission may not necessarily be important in another context. The results also suggest that certain functions may be more closely linked to some duty positions than others. This is not new information, however.

The last question in the survey focused on collective training, specifically, "*How did Land Warrior impact the planning and training of the missions you performed? In other words, did Land Warrior cause a change in any existing battle drills, or to any existing tactics, techniques, and procedures for squad, platoon, and/or company operations?*" This question was also answered by the 14 small-unit combat leaders and the 7 SMEs. Three of the 14 combat leaders did not respond. Of the SMEs, only one did not respond. The responses are categorized into six areas as shown in Table 6. The categories of responses are listed in "Summarized Responses" column. The other two columns indicate how many personnel made that particular point and identifies if they were combat leaders or SMEs.

Table 6. *OIF Leader and SME Responses to the Open-Ended Question on Training*

Summarized Responses	**Leaders** (n = 11)	**SMEs** (n = 6)
Enhanced situational awareness and understanding (SA/SU)	9 (82%)	2 (33%)
Streamlines techniques/move faster	0 (0%)	2 (33%)
Enhanced navigation	1 (9%)	0 (0%)
Facilitated rehearsals	0 (0%)	3 (50%)
No change to existing tactics, techniques and procedures	3 (27%)	2 (33%)
Requires additional time before and after a mission	1 (9%)	0 (0%)

Note. Percentages based on number of individuals who responded.

The responses indicate that situational awareness and understanding (SA/SU) were enhanced significantly by LW, but that there were no changes to existing battle drills, tactics, techniques, and procedures. Essentially, the LW enabled Soldiers to execute missions more effectively than they would have without the system. Even though the tempo of basic task performance was accelerated by the employment of LW, one can not discount the point made by one combat leader that LW increases the time necessary to conduct pre-mission checks and to re-fit following an operation. The responses indicated that the exercise of "command and control" was enhanced by LW. The responses did not identify any particular collective training event that needs to be conducted during NET or during doctrine and tactics training (DTT), but do support the need for the unit to have collectively exercised a mission from the planning phase to the consolidation and reorganization phase to learn the impact that LW has upon operational tempo, SA/SU, and command and control.

Given the similarities of LW to the GSS, the collective training phase of the NET remains a mandatory requirement. This collective training phase is executed the same for both GSS alternatives.

Other Courses

To maximize the unit's employment of the GSS, two additional training programs must be conducted to supplement the efforts of NET and DTT. These courses will be presented by the materiel developer (MATDEV) to the receiving unit during the fielding process. The MATDEV will be required to sustain the unit's ability to perform the functions trained in these courses until the time when these terminal learning objectives (TLO) can be integrated into the appropriate institutional training courses.

GSS Expert Course. The interviews with the two OIF SMEs revealed that an additional training requirement for the GSS was an individual within each platoon who has specialized system maintenance skills. In addition, it also became apparent that this individual needs to be responsible for training replacement personnel. You will note that about half the OIF survey sample was trained on the LW system while deployed (see Table 4). The estimated training time for these additional skills is 32 hours (4 days). The tasks trained in this course are an expansion of the previously trained material. The GSS AoA training assessment did not estimate the costs associated with this course of instruction.

The NET training concept for these skills is as follows. In an effort to sustain the unit's ability to employ the GSS following NET, the unit commander will designate at least one leader per platoon to become a GSS Expert. The GSS Expert will be trained to qualify replacement Soldiers on the GSS and to perform detailed fault isolation and troubleshooting. Individuals who undergo this training must be graduates of the GSS Leader-Digital Planner track. The course requires 32 hours of instruction and practical exercise. Additionally, the GSS Expert will be the unit's principal trainer to qualify replacement personnel. The MATDEV will be required to train and sustain the unit's GSS Experts until the terminal learning objectives for the course are integrated into GSS institutional training. It is anticipated that this training will follow the Brigade/Battalion/Company NET. The estimated numbers of individuals to attend this training are provided in the NET section of this report.

For the GSS institutional training analysis in this report, an additional four days for GSS Expert training was not added to the core program of instruction cited previously (reference Table 3).

EPLRS Network Management (ENM) Course. Prior to the commencement of any GSS communication exercises in NET or DTT, the unit's communications personnel ((Career Management Field) CMF 25) require training on the introduction of the GSS communications devices and gateways into the EPLRS network. This course requires approximately 16 hours of instruction and practical exercise. Some of the students will also undergo GSS qualification training during NET; however, not all the unit's communications personnel who will have responsibilities in regards to the ENM will employ the GSS. The resources necessary to execute this course were not examined in the current GSS AoA training analysis.

Basis of Issue for Each Alternative

Because the basis of issue (BOI) impacts both the institutional training and NET resources, it is presented prior to the details on the institutional and NET EEAs. The BOIs for each alternative were provided by TRAC-WSMR. The individual positions were reviewed with the training representative from the G3, Infantry School to determine the positions for the Leader-Digital Planner track. These numbers are summarized for each alternative and by the Brigade elements and Stryker battalions in Table 7. Several patterns are evident in this table. For Brigade elements, the GSS BOIs have similar numbers of individuals. Within the Stryker Battalion, the numbers of individuals in the Leader-Digital Planner tracker are similar, but the Squad track for the team leader alternative (GSS TL) is twice the size as the Squad track for the squad leader alternative (GSS SL). Clearly, differences in the alternatives within the Stryker Battalion were impacted by whether or not individuals at the team leader level had the system. Table 8 presents the BOIs by study alternative, specific duty position, and training track.

Table 7. *Numbers of Individuals in the two Training Tracks for a Brigade NET*

Training Track	**GSS SL Alt**	**GSS TL Alt**
Brigade Elements Total	(140)	(158)
Leader-Digital Planner Track	94	94
Squad Track	46	64
Stryker Battalion Total (3 Battalions)	(429)	(654)
Leader-Digital Planner Track	213	213
Squad Track	216	441
Brigade Total	569	812

Table 8. *Numbers of Individuals with the System in Each Alternative by Duty Position and by Leader-Digital Planner and Squad Tracks*

Duty Position	**Psn in Ldr-Dig Track?**	**GSS SL Alt**	**GSS TL Alt**
Brigade Level Assets (x1 per SBCT)			
Brigade HQ			
Bde Cdr	YES	1	1
Bde XO	YES	1	1
Bde S-2	YES	1	1
Bde S-3	YES	1	1
Bde CSM	YES	1	1
Tactical Intel Officer	YES	1	1
Deputy Commander	YES	1	1
Bde FS Coord	NO	1	1
Effects coordinator (FSO)	YES	1	1
ENG Company			

Duty Position	Psn in Ldr-Dig Track?	GSS SL Alt	GSS TL Alt
EN Co Cdr	YES	1	1
EN Co XO	YES	1	1
EN Co 1SG	YES	1	1
Eng Medic (Trauma Specialist)	NO	3	3
ENG Platoon (x 3 per SBCT)			
Engineer Platoon Plt Ldr	YES	3	3
Engineer Platoon PSG	YES	3	3
Engineer Platoon Squad Ldr	NO	9	9
Engineer Platoon (Sappers) Tm Leader	NO	0	18
Mobility Spt Plt Ldr	YES	1	1
Mobility Spt Plt Bridge supervisor	YES	1	1
Mobility Spt Plt Sgt	YES	1	1
Mobility Section - Section Sgt	YES	3	3
Signal Company			
Tactical Comms Sect - Retrans Tm Chief	YES	3	3
RSTA Squadron			
Sqdn Cdr	YES	1	1
Sqdn S-3	YES	1	1
Sqdn S-2/ISR	YES	1	1
Sqdn XO	YES	1	1
CSM	YES	1	1
HQ Troop HQ Cdr	YES	1	1
HQ Troop HQ XO	YES	1	1
HQ Troop HQ 1SG	YES	1	1
Combat Medic Section			
RSTA Medic (Trauma Specialist)	NO	9	9
Fires Cell/Platoon			
FSO (effects coordinator)	YES	1	1
Fires Spt Plt - FSO	YES	3	3
Fires Spt Plt - FSpt Spec	YES	6	6
Fires Spt Plt - F Spt SGT	YES	3	3
Reconnaissance Troop x 3			
Trp Cdr	YES	2	2
Trp XO	YES	2	2
Trp 1SG	YES	2	2
Recce Plt Ldr	YES	6	6
Recce PSG	YES	6	6
Recce Plt HUMINT Collection SGT	YES	6	6
Recce Plt Tm Ldr	NO	12	12
Surveillance Troop HQ			
Surv Troop HQ Cdr	YES	1	1
Surv Troop HQ XO	YES	1	1
Surv Troop HQ 1SG	YES	1	1
Mortar Section			
Mtr Section Ldr	YES	1	1

Duty Position	Psn in Ldr-Dig Track?	GSS SL Alt	GSS TL Alt
Mtr Sqd Ldr	NO	2	2
FA Battalion			
Cdr	YES	1	1
XO	YES	1	1
CSM	YES	1	1
S3	YES	1	1
S2	YES	1	1
HQ Battery HQ			
Cdr	YES	1	1
XO	YES	1	1
1SG	YES	1	1
Trauma specialist (medic)	NO	3	3
FA Battery HQ			
Cdr	YES	1	1
XO	YES	1	1
1SGT	YES	1	1
Firing Plt Hq			
Plt Ldr	YES	2	2
Plt Sgt	YES	2	2
Survey Section Team Chief	NO	1	1
Anti-Armor Company			
CO Hq Cdr	YES	1	1
Co Hq XO	YES	1	1
Co HQ 1SG	YES	1	1
Trauma Specialist (Medic)	NO	3	3
Fires Spt Platoon			
Fire Spt Officer	YES	1	1
Fire Spt Specialist	NO	1	1
RTO	NO	1	1
Fire Support SGT	NO	1	1
Subtotals for Bde Elements		**140**	**158**
Stryker Battalion (x3 per SBCT)			
Stryker Battalion			
BN Cdr	YES	1	1
BN XO	YES	1	1
BN S2	YES	1	1
BN S3	YES	1	1
BN CSM	YES	1	1
BN RTO	YES	2	2
HHC HQ			
Cdr	YES	1	1
XO	YES	1	1
1SGT	YES	1	1
Retrans Supervisor	YES	1	1

Duty Position	Psn in Ldr-Dig Track?	GSS SL Alt	GSS TL Alt
Recon Plt HQ Plt Ldr	YES	1	1
Recon Plt HQ PSG	YES	1	1
Recon Plt HQ TM Ldr	NO	3	3
Recon Plt HQ Asst Tm Ldr	NO	0	3
Recon Plat Medic	NO	1	1
FS Element FSO	YES	1	1
Mortar Plt HQ Plt Ldr	YES	1	1
Mortar Plt HQ PSG	YES	1	1
Mortar Plt HQ Section Ldr	YES	1	1
Mortar Squads Sqd Ldr	NO	4	4
Mortar Medic	NO	1	1
BN Sniper/Squad Sqd Ldr	NO	1	1
BN Sniper/Squad Sr Sniper	NO	2	2
Infantry Company x 3			
Company HQ Co Cdr	YES	3	3
Company HQ Co XO	YES	3	3
Company HQ Co 1SG	YES	3	3
Co FSO	YES	3	3
Co Medic	NO	3	3
Company HQ RTO	YES	6	6
Sniper Team Sr Sniper	NO	6	6
Rifle Platoon			
Rifle Plt's Plt Ldr	YES	9	9
Rifle Plt's PSG	YES	9	9
Rifle Plt's RTO	YES	9	9
Rifle Plt's FO	YES	9	9
Rifle Platoon Medic	NO	9	9
Rifle Squads Sqd Ldr	NO	27	27
Rifle Squads Fire Tm Ldr	NO	0	54
Weapons Squad Sqd Ldr	NO	9	9
Weapons Squad Asst. MG	NO	0	18
Mortar Section Sec Ldr	NO	3	3
Mortar Section Sqd Ldr	NO	3	3
Stryker Battalion Total		**143**	**218**
Total for 3 Battalions per SBCT		**429**	**654**
SBCT TOTAL: Stryker Battalions plus Brigade Elements		**569**	**812**
7 (seven) SBCTs		**3983**	**5684**

Training Strategy and Resources – Institutional Training

Functional courses are additional courses, instituted for a limited period of time until the corresponding content can be included in existing professional development courses. Thus additional resources, such as instructors[9], equipment, classrooms, etc. are needed to support this training. As indicated below, not all these resources could be formally addressed in the current AoA.

System and Instructor Requirements for Functional Courses

In order to estimate the system and instructor resources needed for the functional courses, for each alternative the total number of individuals with a system in the target population of 7 SBCTs was determined. These totals were provided previously in Table 4 in the BOI section. In addition, the following assumptions were made.

- Functional courses only train replacement individuals for units which have already experienced NET. The functional courses will train all individuals, regardless of specialty (Infantry, medics, engineers, field artillery, etc.), who are assigned to a GSS-equipped unit.
- Yearly student load for the functional courses was assumed to be 30% of the number of fielded systems. In other words, there is expected to be a 30% turnover of personnel per year in the SBCTs. This assumption was the same as that made in the prior LW Block II AoA.
- Class size was determined to be 30, consistent with the prior LW Block II AoA.
- Number of instructors was 1 per 6 students (a 1 to 5 ratio was applied in the LW Block II AoA and a 1 to 6 ratio was applied in the LW AoA Update),
- Every student and instructor will be issued a system.
- Length of the core POI was determined to be 16 days (see Table 3, includes in/out processing time for functional courses).
- Within a calendar year, there is a total of 10 training "cycles." Multiple courses must be held simultaneously within each training cycle to accommodate the yearly student load. According to the G3, USAIS, an instructional year constitutes 48 weeks. Once a functional course is complete, the GSS systems assigned to that course can be used for a following course.
- For purposes of this analysis, the assumption is that functional courses will be held at Ft. Benning, GA.

Table 9 integrates these assumptions and shows the system and instructor requirements for each alternative.

[9] Consistent with typical terminology, the term "instructor" is used for the institution's Functional Courses, while the term "trainer" is used for NET.

Table 9. *System and Instructor Requirements for Each Alternative for the Functional Courses*

Training Resources	**GSS SL Alt**	**GSS TL Alt**
• # fielded LW Systems w/ 7 SBCT	3983	5684
• Estimated yearly student throughput replacement #s (30% of fielded systems)	1195	1705
• # courses per year with class size of 30	40	57
• Length of functional course Core POI GSS Expert	 16 days 4 days	 16 days 4 days
• # training "cycles" per year	10	10
• Maximum number of courses held concurrently [a]	4	6
• Maximum student load for a training "cycle"	120	180
• Maximum number of instructors required (5 instructors for class size of 30)	**20**	**30**
• Maximum number of systems required w/ maximum student load (student plus instructor requirement)	**140**	**210**

[a] To illustrate how these numbers were calculated, with GSS TL Alt, 57 courses must be held. Five courses would be conducted simultaneously 10 times a year (10 training cycles), which accounts for 50 courses. Seven additional courses would be held twice a year. Thus the maximum number of courses conducted simultaneously is 6.

As shown in Table 7, the maximum number of concurrent courses affects the number of systems and instructors that are required. However, the yearly student throughput impacts ammunition consumption, as ammunition is a consumable resource.

Ammunition Requirements for Functional Courses

Ammunition is needed to conduct reduced exposure fire training using the DVS and the TWS. Ammunition requirements (5.56 ball) were based on the rationale used in the LW Update for NET. The rationale was as follows. For each individual in the Squad track, 290 rounds were allocated: 50 rounds to zero the DVS in both fields of view, 200 rounds for training both defensive and hasty reduced exposure positions, and 40 rounds for testing. For each leader in the Leader-Digital Planner track, 140 rounds were allocated. Only the defensive position was trained (50 rounds for zeroing, 70 rounds for training, and 20 rounds for testing). For individuals in the duty positions assigned the TWS, 115 rounds were allocated per individual for training and testing in reduced exposure defensive positions. In each case, additional rounds were included for retesting, based on the assumption that 25% of the Soldiers would be retested.

The number of rounds required in the functional courses was determined as follows. For each alternative, the percentages of individuals in the Leader-Digital Planner track and the Squad track were determined. These percentages were then applied to the yearly student load to

estimate the numbers of individuals in the Leader-Digital Planner track and those in the Squad track. These numbers were then multiplied by the corresponding number of rounds (290 per individual in the Squad track and 140 per individual in the Leader-Digital Planner track).

Lastly, the number of rounds for those individuals assigned the TWS was estimated. The BOI for the TWS can vary. However, the assumption used in the current analysis was the same as that for the prior LW Update: three (3) TWS per squad in the Stryker Battalion; that is the squad leader and the two team leaders. This number was applied to the GSS TL Alternative, where the GSS is given to team leaders. However, for the GSS SL Alternative, it was assumed only the squad leader had the TWS for reduced exposure firing. The numbers of squad leaders and team leaders needing functional course training was then estimated for each alternative, and the corresponding number of rounds determined.

The summary of the yearly ammunition (5.56 ball ammunition) requirement is in Table 19. The rounds for the DVS and TWS are cited separately.

Table 10. *Yearly Ammunition Requirements for Functional Courses for Each Alternative (rounded up to the nearest 1000).*

	# of Rounds (5.56 ball)	
Optic	**GSS SL Alt**	**GSS TL Alt**
DVS	250,000	398,000
TWS	42,000	123,000
Total	292,000	521,000

Training Support: Embedded Training and Training Aids, Devices, Simulations and Simulators (TADSS)

A unique training capability required for the GSS is embedded training (ET). This implies that, at a minimum, there will be some embedded system-specific exercises on critical tasks that individuals must perform using embedded training software on their system. In addition, the software will have a learning management system that scores individual performance and provides feedback to the individual. The training cost analysis for the two GSS study alternatives includes resources for developing embedded training and incorporating it in the GSS design.

Since ET is only part-task training, additional training aids, devices, simulations, and simulators (TADSS) must also be provided. The following TADSS were assumed for each alternative in the conduct of the training analyses and are included in the life-cycle system costs. System-specific TADSS are the following:

Interactive multi-media (IMI) CD-ROM on operation of LW system for every Soldier
Monitor with training cable for each instructor for classroom use to observe performance
Handheld device for each instructor to plug into Soldier system to observe performance during practical exercises and in situational exercises in the field.

Power adaptor per each system for reducing battery usage in classroom instruction
Videotape on reduced exposure firing (developed previously; may need updating for the GSS system)
Electronic technical manual
Tactical engagement system
Support for digitized ranges

Another IMI product (ARI, 2003) was developed to address prerequisite training deficiencies. This IMI product focuses on some LW prerequisite skills (orders, graphic control symbols, map reading, messages, thermal weapon sight). The IMI CD-ROM on prerequisite skills (ARI, 2003) was delivered to the PM-LW for use, when needed.

Table 11. *Major TADSS Required for Functional Courses for Each Alternative*

Major TADSS	**GSS SL Alt**	**GSS TL Alt**
Handheld Device (HHD): 1 per instructor	20	30
Monitors with cable: 1 per instructor	20	30
System power adaptor: 1 per system (Soldier)	120	180

Additional Resources for Functional Courses

Additional resources are required to support functional course training and to have a complete system for each Soldier. The GSS integrates its unique equipment with government furnished equipment (GFE). For example, every individual must have a modular weapon system. Soldiers use the AN/PVS-14 monocular night vision goggles. Some, but not all the required GFE items, are in the weapons pool at Ft. Benning. But there are insufficient numbers of items to support the additional functional courses, as these GFE items are dedicated to supporting existing US Army Infantry School courses. The quantities of GFE items required for each alternative are in Table 12. Except for the TWS, these GFE items correspond to the maximum number of systems needed for students per Table 6. TWS has a limited BOI, per the prior presentation of ammunition requirements for the TWS (see also note to Table 12).

Table 12. *GFE for Functional Courses*

GFE	**GSS SL Alt**	**GSS TL Alt**
M4 Carbine with Picatinny rail	120	180
M68 Close combat optic	120	180
AN/PVS-14 Monocular Night Vision Device	120	180
AN/PAS-13B Light Thermal Weapon Sight	20	55

Note. TWS numbers per course estimated on the basis of yearly throughput of rifle squad leaders (GSS SL Alt, n = 170/yr) and/or rifle squad leader and team leaders (GSS TL Alt, n = 510/yr) in functional courses.

The other major resource requirement for the functional courses is additional instructors. These numbers were presented previously (reference Table 9), and are not repeated here. It is

important to reiterate that the instructors for functional courses are “additional” trainers. The functional courses require instructors above and beyond the current instructor pool. How these positions will be manned in the future is impossible to determine at this point in time. Such decisions could also impact some of the resources identified in this analysis. In addition, if MTTs are used to train replacements on-site at a unit, then the number of instructors could change and the system required to support functional courses at the Infantry School could decrease as well as other requirements such as GFE quantities. Instructors are an institutional requirement and therefore were not costed.

Training Strategy and Resources – New Equipment Training

The strategy for New Equipment Training (NET) is very similar to that developed in the LW Update analysis. The core POI as presented in Table 3 indicates the content and time to conduct the Squad and Leader-Digital Planner tracks. The concept was to conduct these two tracks concurrently for a specific unit, so upon conclusion of individual training, all unit personnel can merge for collective training during the last four days. "Units" were defined as a Stryker Battalion and the Brigade elements. As with the functional courses, several classes must be conducted simultaneously to achieve this goal and to keep the class size under 50 individuals. In the observations of NET conducted during the LW Update (Dyer & Tucker, 2007), the battalion NET was conducted with class sizes of 100. This class size, particularly with the diverse population from the companies and the battalion, was not conducive to effective training. A primary recommendation from that analysis was to keep the NET class size under 50.

The resources cited in this section pertain to a single Brigade NET. Given that the time to conduct the core NET POI is estimated to be 18 days, a NET training cycle was determined to be one month in length. With limited classroom and range resources, and limited numbers of qualified NET trainers, the NET strategy is to distribute the training over a reasonable period of time, rather than to concentrate it in a single, one-month period.

As with the functional courses, the ratio of trainers to students is 1 to 6. It was assumed that each trainer would have a GSS ensemble. Hand held displays, projection systems, and system monitors are also required.

NET Training Sequence

Table 13 illustrates the overall NET strategy for a single SBCT. Each study alternative is shown. Note that within each NET (each month), there is both a Leader-Digital Planner track and a Squad track for a given "unit" (i.e., brigade or battalion). This is consistent with the core POI presented in Table 3. Thus individuals in the Leader-Digital Planner track are linked with those from their unit in the Squad track to conduct the collective training, which follows the individual training. In addition, the unit collective training phase will include Soldiers from the unit who do not have a system, as the unit must learn to function effectively with all Soldiers, regardless of equipment.

Table 13. *Brigade NET Sequence and Strategy for Each Alternative (excluding GSS Expert training)*

Month 1	Month 2	Month 3	Month 4
GSS SL Alt.. 569 individuals to train / 24 instructors max			
Bde: Ldr-Digital Planner Track n = 94 2 classes 16 trainers	1st Bn Ldr Digital Planner Track n = 71 2 classes 12 trainers	2nd Bn Ldr Digital Planner Track n = 71 2 classes 12 trainers	3rd Bn Ldr Digital Planner Track n = 71 2 classes 12 trainers
Bde: Squad Track n = 46 1 class 8 trainers	1st Bn Squad Track n = 72 2 classes 12 trainers	2nd Bn Squad Track, n = 72 2 classes 12 trainers	3rd Bn Squad Track, n = 72 2 classes 12 trainers
GSS TL Alt. 812 individuals to train / 38 instructors max			
Bde: Ldr-Digital Planner Track n = 94 2 classes 16 trainers	1st Bn Ldr Digital Planner Track n = 71 2 classes 12 trainers	2nd Bn Ldr Digital Planner Track n = 71 2 classes 12 trainers	3rd Bn Ldr Digital Planner Track n = 71 2 classes 12 trainers
Bde: Squad Track n = 64 2 classes 11 trainers	1st Bn Squad Track, n = 147 4 classes 26 trainers	2nd Bn Squad Track n = 147 4 classes 26 trainers	3rd Bn Squad Track n = 147 4 classes 26 trainers

Table 13 also shows that the length of a Brigade NET is the same for each alternative – 16 weeks (4 months). The GSS TL Alternative has the maximum number of trainers, that is, 38, when each Battalion is trained. However, when only individuals down to the squad leader level have a system, the maximum number of trainers drops to 24. A greater description of the class composition and resource requirement is in Table 14.

Table 14. *Number and Composition of NET Classes for Each Alternative, Displayed by the Leader-Digital Planner and Squad Tracks*

Class Composition and Number of Individuals to Train				
	Brigade		Battalion Model (Only one Battalion illustrated)	
# Classes	Leader-Digital Planner Track	Squad Track	Leader-Digital Planner Track	Squad Track
	GSS SL Alt			
1	RSTA Squadron (49)	All at Brigade including medics (46)	All at Bn (except Medics) plus all at company (35)	All Bn and Co Medics plus other individuals at Bn (24)
2	All other Brigade elements (45)		All at platoon (36)	All within A, B, and C Company (48)
	GSS TL Alt			
1	RSTA Squadron (49)	Brigade medics (18)	All at Bn (except Medics) plus all at company (35)	All Bn and Co Medics plus other individuals at Bn (27)
2	All other Brigade elements (45)	All others at Brigade (no medics) (46)	All at platoon (36)	A Company (40)
3				B Company (40)
4				C Company (40)

The strategy presented here is that the specialized trainer and maintenance training for selected individuals who will become "GSS Experts" will follow the core training for the Brigade. Using the basic rationale that one individual within a platoon needs these skills, it was estimated that 48 individuals within a brigade would be selected by the unit for this training. The numbers are estimated as follows:

Stryker Battalion, total of 39
- 1 per Bn HQ, total of 3
- 1 per company, total of 9
- 1 per platoon, total of 27

Brigade elements, total of 9

With 1 trainer per 6 individuals, a total of 8 instructors is required regardless of alternative. The associated cost for the instructors required for this training was not estimated.

Nonconsummable Resources for NET

Table 15 presents nonconsumable training resources required for NET. This includes the number of trainers, the number of systems needed for the trainers, the number of classrooms and over-head projection systems, plus the TADSS that were cited for functional courses. Each trainer needs a system, a monitor for observing individual performance on the system within the classroom, and a HHD for monitoring individual performance in a field training environment. Each classroom should be equipped with a monitor and overhead projection system to enable the principal instructor to demonstrate the network and features of the system. In addition, a power cable adaptor is needed for each system to conserve battery power during classroom training.

Table 15. *Nonconsumable Resources for NET, Including Major TADSS, for Each Alternative (refer to Table 13 for composition of classes)*

Month	**Units Trained**	**Training Resources**		
		# Power Adaptors (= # Soldiers)	**Max # Trainers plus # systems, HHDs & monitors for trainers**	**# Classrooms / # projection systems**
GSS SL Alt				
1	Brigade Ldr-Digital Planner and Squad Tracks	140	24 plus 24 / 24 / 24	3 / 3
2	1st Battalion Ldr Digital Planner and Squad Tracks	143	24 plus 24 / 24 / 24	4 / 4
3	2nd Battalion	Same as 1st Battalion		
4	3rd Battalion	Same as 1st Battalion		
GSS TL Alt				
1	Brigade Ldr-Digital Planner and Squad Tracks	158	27 plus 27 / 27 / 27	4 / 4
2	1st Battalion Ldr Digital Planner and Squad Tracks	218	38 plus 38 / 38 / 38	6 / 6
3	2nd Battalion	Same as 1st Battalion		
4	3rd Battalion	Same as 1st Battalion		

Consistent with the functional course section, it was assumed that the systems will have some embedded training exercises. The other TADSS cited for functional courses were:

Interactive multi-media (IMI) CD-ROM on operation of LW system for every Soldier
Power adaptor for each system for reducing battery usage in classroom instruction
Videotape on reduced exposure firing
Electronic technical manual
Prerequisite skills IMI

Ammunition Requirements for NET

The only consumable resource identified was ammunition for marksmanship training and testing with the DVS and TWS. The ammunition allocated to each individual was determined to be the same as that used in the functional courses. Each individual in the Squad track is allocated 290 rounds for the DVS. Each individual in the Leader-Digital Planner track is allocated 140 rounds for the DVS. Each individual with a TWS is allocated 115 rounds. Additional rounds are included for retesting, based on the assumption that 25% of the Soldiers would be retested. The ammunition summary is at Table 16.

Table 16. *Ammunition Requirements for a Brigade NET (rounded up to the nearest 1000).*

	# of Rounds (5.56 ball)	
Optic	**GSS SL Alt**	**GSS TL Alt**
DVS	119,000	190,000
TWS	20,000	59,000
Total	139,000	249,000

Unit Training

The unit training strategy[10] for a unit equipped with GSS is the same for both alternatives. Unit training will be determined by the unit's Mission Essential Task List (METL). It was assumed that the Soldier's use of GSS when training the METL will sustain their skills and knowledge. However, it is recommended that units conduct re-training/re-testing of the individual tasks trained in NET on a quarterly basis. This requirement will be published in the next update to the GSS STRAP. Individual sustainment of the skills and knowledge will be supported by the stay-behind package as well as by web-based training products. During NET, the Training Team will deliver all of its training support packages, programs of instruction, transparencies, student handouts, tests, quick reference cards, and operator guides to the unit. This stay-behind package will enable the unit to conduct its own training. In addition to the Operators Guide and the GSS prerequisite skills CD-ROM which is provided to each Soldier, web-based operator/leader training will be developed and will be available to the Soldier via the Stryker University, the Warrior University, and Army Knowledge On-Line.

The Warrior University portal is organized as a professional "home" for Infantry Soldiers and leaders to facilitate and foster lifelong professional relationships. The mission of Warrior University will be to synchronize and integrate all Infantry training so that the right Soldiers receive the right training at the right time, regardless of their physical location. It will serve as the Infantry School's executive agent for use of technology to enhance resident instruction, to meet the training needs of field units, and to quickly disseminate information on new systems and lessons learned in the contemporary operating environment.

[10] Thomas Foster, G3, US Army Infantry School was the author of the section on unit training.

Summary

The two GSS alternatives did not differ in terms of total training time. The differences existed in other training resources, with the team leader alternative requiring more training resources as there are more individuals to train. Most training resources for the core program of instruction were a direct function of three factors: the number of systems, the number of instructors / trainers, which was influenced by the number of systems, and/or the number of individuals to train. The two resources not influenced by number of systems were the length of the functional course and the length of a Brigade NET.

Instructors in the institutional functional courses and the trainers in NET must have systems. Systems are also required for students in the functional courses. The TADSS that each instructor or trainer must use directly correspond to the maximum number of instructors or trainers. The number of system power adaptors corresponds to the maximum number of systems used during training. Ammunition requirements relate directly to the number of individuals being trained. Table 17 summarizes these training quantities for the core POI.

Table 17. *Training Resource Summary (equal #s for the two alternatives are highlighted)*

	GSS SL Alt	**GSS TL Alt**
# Soldiers in 7 SBCTs	3983	5684
	Functional Courses – Yearly Requirements	
Length of Functional Course (core POI)[a]	16 days	16 days
# of courses per year	40	57
Maximum # systems for students	120	180
Maximum # instructors	20	30
Maximum # systems for instructors	20	30
Maximum # HHDs / monitors	20/20	30/30
Maximum # system power adaptors	120	180
Ammunition (# rds 5.56 ball)	292,000	521,000
	New Equipment Training – 1 Brigade	
Length of Brigade NET (core POI) [b]	4 months	4 months
Maximum # trainers in NET team	24	38
Maximum # systems for trainers	24	38
Maximum # HHDs / monitors	24/24	38/38
Maximum # system power adaptors	143	218
Ammunition (# rds 5.56 ball)	139,000	249,000

[a] excludes 4 days of GSS Expert training

[b] excludes 4 days of GSS Expert training for 48 individuals.

Lastly, following the completion of Brigade NET, a four-day GSS Expert course will be held for selected individuals. This course will ensure unit expertise in two areas: training and

sustaining Soldier skills on the system including replacement personnel, and conducting system fault isolation and troubleshooting. There are no differences between the alternatives with regard to this training with 48 individuals required for both alternatives.

A unique and additional GSS cost is that of incorporating embedded training into the GSS design. This requirement applies to both GSS alternatives.

The experience of the LW-equipped unit serving in OIF showed that the core program of instruction developed in this training impact analysis for the GSS is sound. However, the requirement for two additional, specialized courses / training was identified. One course would train selected unit personnel to qualify replacement personnel and to perform detailed system fault isolation and troubleshooting. A second course is needed to train communication personnel on the network. These courses are required for both GSS alternatives. OIF data also supplements the requirement for collective training during NET. This phase of the program is the chance for the unit to experience the changes to the operational tempo caused by the GSS and will help them to adapt their procedures to the employment of the new system.

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Report Acronyms

AAR	After action review
AoA	Analysis of Alternatives
BCT	Brigade Combat Team\
Bde	Brigade
BLOS	Beyond line of sight
Bn	Battalion
BOI	Basis of issue
CDD	Capabilities Development Document
CFF	Call for fire
CFM	Call for medic
CMF	Career Management Field
DOTMLPF	Doctrine, organization, training, materiel, leadership and education, personnel and facilities
DTT	Doctrine and tactics training
DVS	Daylight video sight
EEA	Essential element of analysis
ENM	EPLRS network management
ET	Embedded training
FBCB2	Force XXI Battle Command Brigade and Below
GFE	Government Furnished Equipment
GPS	Global positioning system
GSS	Ground Soldier System
HHD	Handheld device
IMI	Interactive multi-media instruction
LW	Land Warrior
MATDEV	Materiel developer
MDP	Mission Data Package
MDSE	Mission data support equipment
METL	Mission essential task list
MS	Milestone
MTT	Mobile Training Team

NET	New Equipment Training
OIF	Operation Iraqi Freedom
POI	Program of instruction
RFI	Rapid fielding initiative
RSTA	Reconnaissance, surveillance, and target acquisition
SA	Situation awareness
SAM	Soldier access module
SBCT	Stryker Brigade Combat Team
SCU	Soldier control unit
SL	Squad leader
SME	Subject matter expert
STORM-MLRF	Small tactical optical rifle-mounted micro-laser range finder
STRAP	System Training Plan
SU	Situation understanding
TADSS	Training aids, devices, simulations and simulators
TCM-Soldier	TRADOC Capabilities Manager-Soldier
TL	Team leader
TLO	Terminal learning objective
TRADOC	Training and Doctrine Command
TRAC-WSMR	TRADOC Analysis Center – White Sands Missile Range
TWS	Thermal weapon sight
UAV	Unmanned aerial vehicle
UGS	Unmanned ground system
USAIS	US Army Infantry School
VIK	Vehicle integration kit